United States of America
OCCUPATIONAL SAFETY AND HEALTH REVIEW COMMISSION
1120 20th Street, N.W., Ninth Floor
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SECRETARY OF LABOR, Complainant, v. ARCADIAN CORPORATION, Respondent.	OSHRC Docket No. 93-0628

DECISION

Before: RAILTON, Chairman; ROGERS and STEPHENS, Commissioners.

BY THE COMMISSION:

On July 28, 1992, a pressurized urea reactor exploded after normal working hours at Arcadian Corporation's ("Arcadian's") fertilizer plant in Lake Charles, Louisiana, destroying the facility. Following an investigation of the explosion, on January 27, 1993, the Secretary of Labor ("Secretary") issued several citations to Arcadian.[1] At issue before us is a single

[1] The Secretary originally cited separate violations for each of the eighty-seven employees exposed to the same hazardous condition. Arcadian moved for partial summary judgment arguing that citation 2, items 2 through 87 should be vacated as duplicative and their allegations consolidated with item 1 because the facts alleged in items 1 through 87 indicated conditions that constitute only a single violation of an employer's duty under section 5(a)(1). Administrative Law Judge Stanley M. Schwartz severed into a new docket number, 93-3270, items 2 through 87 of citation 2, granted Arcadian's motion for partial summary judgment, and vacated those items. On review, the Commission agreed with his disposition, finding that "a violation of section 5(a)(1) is based on the condition(s)

allegation that Arcadian willfully violated section 5(a)(1) of the Occupational Safety and Health Act ("the Act"), 29 U.S.C. § 654(a)(1),[2] (the "General Duty Clause"), by exposing employees to the hazard of being struck by flying debris, suffering heat and chemical burns, and asphyxiation by toxic gasses by the reactor's explosion caused by Arcadian's improper operation of the reactor. The citation identified three methods of abating the cited hazard: (a) shutting down the reactor upon the previous detection of leaks in the vessel's lining; (b) implementing an adequate program to ensure that the reactor's leak detection system was properly monitored; and (c) assuring that critical welds were performed according to industry standards and design specifications. The judge treated each of these three methods of abatement as separate hazards. He found that (a) and (b) were willful violations, (c) was a serious violation, and assessed the $50,000 proposed penalty. We conclude that the judge erred in finding that the three cited methods of abatement were themselves separate hazards. For the reasons set out below, we find that the record establishes that Arcadian's employees were exposed to serious injuries presented by the improper operation of the reactor and that Arcadian willfully violated section 5(a)(1) by failing to abate that hazard.

I. Does the record support the judge's findings that Arcadian violated section 5(a)(1) of the Act?

A. Background - Urea Reactor Design and Operation

The reactor was approximately 90 feet tall and 6 feet in diameter and had a capacity of 1836 cubic feet. The reactor was constructed of four 20-foot high cylindrical sections stacked on top of each other, circumferentially welded together as well as to top and bottom "heads" on either end of the reactor. The weld joining the lowest section to the bottom head was

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constituting a recognized hazard, not the exposure of each employee thereto." *Arcadian Corp*., 17 BNA OSHC 1345, 1345-46, 1995-97 CCH OSHD ¶ 30,856, p.42,915 (No. 93-3270, 1995), *aff'd, Secretary of Labor v. Arcadian Corp.,* 110 F.3d 1192 (5th Cir. 1997).

[2] Section 5(a)(1) of the Act provides:

> Each employer – (1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.

designated C-1 and the weld between the top section to the upper head was designated C-9. The three intermediate section welds were designated C-3, C-5 and C-7.

Urea was created inside the reactor vessel by introducing a mixed stream of ammonia and carbon dioxide into the bottom of the reactor at a pressure of approximately 2750-2865 psig (pounds per square inch gauge) and at a temperature of approximately 340-375° Fahrenheit. The pressure on the mixed stream forced it upwards through the reactor where it was further mixed by "trays," attached by "tray clips" to various points inside the reactor. The mixed stream formed ammonium carbamate, an intermediate stage in urea synthesis. Urea would then be separated out of the ammonium carbamate.

Ammonium carbamate is highly corrosive, especially to carbon steel. To contain the corrosive material as well as the heat and pressure involved in creating urea, the reactor had a wall approximately 4 ¼ inches thick, consisting of a corrosion-resistant stainless steel inner lining surrounded by 14 layers of carbon steel, of which the outer 13 layers were used for "design stress." Between the stainless steel liner and the innermost layer of the carbon steel liner was an open space, or "annulus," which extended from the top to the bottom of the reactor. The reactor was constructed with 24 "weep holes"[3] that ran from the outside of the reactor through the layers of carbon steel and terminated at the annulus. They were composed of a low alloy steel, similar to the carbon steel wrapped outer layers, and were installed 120 degrees apart from each other, with three located 22 inches above the C-1 weld, three located 22 inches below the C-9 weld, and three located 22 inches both above and below the C-3, C-5 and C-7 welds. The weep holes had an inside diameter of approximately 3/8 of an inch and an outside diameter of 1/2 an inch. In the event of a breach of the inner stainless steel liner, the reactor's contents would leak out and pass through the weep holes, thereby providing an early warning that a potentially catastrophic condition was developing.

The urea manufacturing process was monitored by three sets of operators. The A operators' were responsible for monitoring the pressure and temperature inside the reactor

[3] Weep holes that were installed into the reactor after repair work are sometimes identified in the record as "leak detection holes" or "leak detection tubes" to distinguish them from weep holes that were installed when the reactor was built.

from the control room board. The A operators also looked at the control room operator's logbook to see what the preceding shift had written, and wrote in the logbook any significant events that occurred on their watch. They also spoke about the reactor's operation with their replacement at the shift change. The only duties the B operators had was to make observations at the lower deck level and the feed lines that went into the reactor. The C operators' responsibilities included checking the reactor's weep holes on an hourly basis. If a C operator saw the reactor's contents coming out of a weep hole, the standard operating procedure was to notify the A operator and the reactor would eventually be shut down. C operators were also responsible for flushing out the affected weep hole with a steam lance to make sure it did not become plugged. Arcadian Urea Area Supervisor Richard Bartley was the supervisor for the A, B and C operators.

B. June 1989 leak

The urea reactor had been shut down because of a leaking weep hole as recently as 1989, when Olin Mathieson Company ("Olin") owned the plant. On June 23, 1989, the urea plant was shut down after leaks were observed in two weep holes, approximately sixty feet from the bottom of the reactor. Operator David Sittig, who had discovered the leak, testified that urea was "blowing out roughly about a foot, foot and a half at the time it was first discovered." He described the leaking material as being whitish in color. Operator Thomas Chapman stated that the leak was "simply an emission of corroded rust colored material from a weep hole" that was "spitting out at a relatively low rate." Operator Cleveland Harris described the leak as being a "white substance" that was coming out in "little spurts."

Sittig notified the lead operator, Mickey Sullivan, who also observed the leak. Sullivan then called urea unit superintendent Dana Baham. Baham described the leak as being "brownish-white-red looking, an off color looking urea." He described the stream as "much the same as you would expect to see if somebody was holding a water hose with a constricted nozzle at that point on the reactor, going out" and that it was streaming out approximately 10 to 15 feet. Baham reviewed the reactor drawings and determined that there had been a breach of the liner, and within one hour of discovering the leak decided that the reactor should be shut down. When asked at the hearing "[w]hat was the basis on which you

made your decision in 1989 to instruct Mr. Sullivan to begin shutting down the reactor," Baham replied: "I had been around this business long enough to know that a leak detection system or a weep hole system was a telltale system of something that told you you had a problem, a breach of the liner. So on that basis, that was the thing to do."

Within a day after the shutdown, Olin assembled a team to begin planning a response to the leak. The team shut the plant down, decontaminated it and cooled it to allow them to enter the reactor. Olin chose an Austrian firm, Schoeller-Bleckmann, to repair the reactor. Two representatives from Schoeller-Bleckmann, Peter Stuckler and Johann Pesak, arrived on June 30. After an extensive investigation, Stuckler and Pesak determined that although the liner was thin in the C-5 weld area, it was repairable. That same day, Pesak and Stuckler left but returned later to supervise Olin's employees as they performed the repairs.

During the 1989 repairs, stainless steel filler patches were welded flush into the reactor's liner in the area of the C-3, C-5 and C-7 circumferential welds where portions of the original liner had been cut away. The filler patches were tack welded to keep them in place. Overlay patches were placed on the inner wall of the liner adjacent to the filler patches. The overlay patches were seal welded to keep the contents of the reactor from escaping. Three more weep holes were added; two along the C-5 weld and one in the C-7 weld area. They were welded to the carbon steel, not the stainless steel liner, and would monitor the space between the carbon steel wraps and the stainless steel liner. A total of 8 patches were installed, and all the tray clips were replaced. The repairs passed an ammonia leak test under Stamicarbon specifications, which showed that the reactor was not leaking. In addition, Olin established through an air pressure test that all the weep holes were clear of any blockage. Olin also performed dye penetrant testing of each weld as well as a hydrostatic test, both of which are non-destructive methods of determining whether the lining and welds were porous. Through these tests they determined that there were no leaks. The work was completed on August 16, 1989.

C. Arcadian's purchase of the reactor

That same month, Arcadian purchased from Olin the urea and ammonia facilities that were located within Olin's Lake Charles complex. In September of 1989, Arcadian shut down the facility to address production problems in the ammonia unit and perform "minor maintenance" in the urea unit. The reactor was also shut down for maintenance repairs or revisions. Such shut downs were known as "turnarounds." There were two later turnarounds, one in early 1990 and another in February 1991. Arcadian personnel, including Baham and Bartley, entered the reactor only during the third turnaround in 1991, when they checked the thickness of the stainless steel liner. Baham and Bartley determined that there had been virtually no change in liner thickness based on their measurements compared to the ones made in 1989.

D. January 3, 1992 leak

On December 31, 1991, minor problems in Arcadian's ammonia plant forced both the ammonia and urea plants to shut down. Both plants were restarted on January 2, 1992. At approximately 1:00 AM on January 3, 1992, operators Dick Richardson, David Baham (Dana Baham's first cousin), and Bill Brunkhardt noticed a small brown blob of urea hanging from a weep hole in the area of the C-7 weld on the northeast side of the reactor. Richardson, who described it as having "a milky color with a rusty color in it," stated that it was approximately five inches long and two inches around and hung from the weep hole like an icicle. They showed it to A operator Mary Poullard-Smith. Poullard-Smith called Dana Baham at home and informed him of the blob. Dana Baham instructed the operators to check and clean out the weep holes. Richardson and David Baham found material in another weep hole to the northwest in addition to the one where the extrusion was found. Richardson steamed out the C-7 weep hole in order to clear it, but did not recall steaming the northwest weep hole. After steaming the weep holes, Dana Baham was informed by David Baham, Richardson, and Bill Brunkhardt that the weep holes that they had steamed were clear, although David Baham did not believe that the other weep holes on the south side and around the head of the reactor were clear. Baham told the operators to continue monitoring the weep holes for further emissions and Poullard-Smith wrote down in the log book per Dana Baham's instructions:

"Note: There may be a possible hole in reactor, so please pay close attention to the weep hole above [valve] PCV 4 per Dana Baham."

Because no more material came from the weepholes that night, Dana Baham believed that the material had not come from a leak in the reactor liner but instead came from residual material from the 1989 leak. He believed that reactor shutdowns and startups created "temperature and pressure cycles" which squeezed the stainless steel lining to the pressure-bearing outer layers and that this action eventually forced the material out of the weepholes. Baham believed that it did not signify a breach in the liner because a breach would have caused a steady stream of material from the weep holes as it did with the breach in 1989.

On the night he was notified of the leak, Dana Baham telephoned his supervisor, Plant Manager Ernest Elsbury, at home and told him of the situation. Although Elsbury's first reaction was that it was a leak and that a shut down was required, Dana Baham told Elsbury that he believed that the extruded material came from material left behind from the 1989 repairs and that while it had leaked earlier, it was not leaking at the time of their conversation. Elsbury decided to keep the reactor running but to continue monitoring because "Dana's reasoning and logic was sound and this probably was material that had been trapped behind the liner." He further testified, "we did not know that it had come from the weep hole and the weep hole was not leaking." Elsbury did not think that he was risking the safety of employees in the plant "[b]ecause this reactor wasn't supposed to fail" since "[i]t had wraps and it was build in a specific way. That's how it kept it from failing." At the daily morning meeting conducted by Elsbury and his staff the following Monday, Dana Baham told of the discovery of the blob and the decisions taken. No one at the meeting disagreed with Dana Baham's decision to continue operations. When Richard Bartley, the urea area supervisor, returned from his vacation, he reviewed the operator's logbook and talked to the operators. He did not remember anyone saying that the blob was found on a weep hole and never saw the blob itself.

E. June 14, 1992 leak

On Sunday, June 14, 1992, at about 6:00 pm, operators Chapman, Sullivan and Poullard-Smith discovered a leak from a weep hole in the C-5 weld area, near the center of the reactor. Poullard-Smith described the leak as "a flow of white liquid coming out of that weep hole, and as it came out, it was fizzling." She claimed that "[i]t wasn't spraying out" but that it was a "stream that was blowing out." Sullivan and Poullard-Smith called Dana Baham at home about the leak. Poullard-Smith testified that Baham said he would look at it when he came in on Monday morning. Sullivan wrote in the logbook: "Weep hole leaking on reactor at 4th floor level (blowing bubbles) informed Dana of situation."

Richard Bartley was informed of the leak when he arrived at the unit on Monday morning shortly before 6:00 a.m. When he went to investigate, he found that the tube contained a "white crystal material" and noted that "every once in a while you could see a small bubble." He flushed out the weep hole with a steam lance and left. When he returned "a little bit later," he saw that the tube again contained more material. He rodded out the tube again with the steam lance and flushed it out until it came out the other leak detection tube. Bartley thought the reactor should be shut down, so he went down to the control room, held the night shift over, and told the operators to begin reducing production levels in preparation for the shutdown. Bartley then drove to the administration building to discuss the leak with Dana Baham.

Bartley believed that the one of the 1989 welds had failed. He told Baham that he believed that the reactor needed to be shut down, but Baham persuaded him that it was not necessary. Based on his review of drawings of the reactor, Baham determined that the leak came from inside the reactor through a leak detection tube from the C-5 area repaired in 1989. Baham showed his journal of the 1989 repairs as well as drawings, repair and reactor data to Bartley. He explained to Bartley his belief that the overlay patch had a fillet weld that had a pinhole-sized leak that was filling the space between the stainless steel overlay and filler patches. He believed that the leak was not in contact with carbon steel because a seal welding of the flush patch protected the carbon steel outer shell. They agreed that the material leaking from the weep hole was not in contact with the carbon steel shell and that it was not necessary to shut down the reactor.

Baham's recommendation to Bartley was that while the current leak required observation, the reactor was safe and there was no need to immediately shut it down. Baham believed that if the leak was in contact with carbon steel, there would have been a reddish discoloration in the discharge. He assumed that the leak was not in contact with the carbon steel liner because he thought that the insert patch at C-5 was full seal welded, and that the leak detection tube went through the carbon steel and was welded to the liner insert patch so that it monitored only the space between the two stainless steel liners.

Bartley's response to the leak was based on his belief that it was not in contact with the reactor's carbon steel layers. According to Bartley, if he knew that the leak detection tube that was leaking the reactor's contents did not monitor the space between the two stainless steel patches, but instead monitored the annulus between the carbon steel layer and the inner stainless steel layer, just like the older weep holes, he would have shut down the reactor. Bartley testified that if the leak had been coming out of one of the originally installed weep holes, he would have shut the reactor down. He also stated that if he had known the patch was actually tack welded and not full seal welded, he would have realized that the reactor's contents could have been in contact with the carbon steel and Bartley would have shut down the reactor. Baham agreed that if the patch was not full seal welded, the reactor's contents would migrate into the carbon steel area "just the same way it did in 1989."

Later that morning, Baham also explained to Elsbury why he thought it was safe to continue using the reactor. After his meeting with Baham, Bartley went to the urea operators and explained to them that they believed the C-5 insert patch was full seal welded. Bartley and the operators decided that they had to wash out the leak detection tube every shift. They then brought the reactor back up to production rates. They planned to make repairs in the area of the C-5 weld during the next scheduled turnaround. Bartley believed that the next turnaround would be in the fall of 1992, but he discovered after the accident that the next turnaround was pushed back to 1993. At the hearing, Bartley was unable to find anything in Baham's journal to show that the patch was full seal welded or that the tube that was installed was welded to the liner. Bartley could not remember what he and Baham read that led them

to conclude that the leak was not coming in contact with the carbon steel lining and that it was safe to operate the reactor.

F. July 28, 1992 explosion

According to A operator Poullard-Smith, "[e]verything was running very well" on the night of the explosion. The explosion occurred at approximately 7:20 p.m. Subsequent investigations commissioned by Arcadian and the Secretary determined that the explosion resulted from the failure of the tray clip weld joint and liner above the C-7 circumferential weld in the northeast quadrant of the reactor due to stress corrosion cracking and weld toe corrosion. Once the stainless steel liner was penetrated, the carbamate corroded the carbon steel layers. Two weep holes in the northeast quadrant above and below the C-7 weld were completely obstructed with corrosion and process products.

G. The citation

Following the investigation of the explosion, the Secretary cited Arcadian for violating section 5(a)(1) of the Act, alleging that it:

> . . . did not furnish employment and a place of employment . . . which was free from recognized hazards that were causing or likely to cause serious physical harm to employees in that there was a catastrophic failure/explosion in a pressure vessel containing liquified Carbon Dioxide (CO2), Ammonia (NH3), Ammonium Carbamate, and urea, under 2850 psig of pressure at a temperature of 370 degrees Fahrenheit, exposing them to; being crushed/stuck by flying/falling debris and/or, heat/chemical burns and/or, asphyxiation/toxic gases.

The citation stated that three "conditions contributed to the existence of this hazard:" (1) not shutting down the reactor upon the detection of leaks; (2) improperly monitoring the reactor for leaks; and (3) inadequately inspecting, repairing, or maintaining the vessel's liner.

H. Discussion

In order to prove a violation of section 5(a)(1), the Secretary must show that a condition or activity in the workplace presented a hazard, that the employer or its industry recognized this hazard, that the hazard was likely to cause death or serious physical harm,

and that a feasible and effective means existed to eliminate or materially reduce the hazard. *Pelron Corp*., 12 BNA OSHC 1833, 1835, 1986-87 CCH OSHD ¶ 27,605, p. 35,871 (No. 82-388, 1986).[4]

(1.) Definition of the Hazard

A hazard must be defined in a way that apprises the employer of its obligations, and identifies conditions or practices over which the employer can reasonably be expected to exercise control. *Pelron*, 12 BNA OSHC at 1835, 1986-87 CCH OSHD at p. 35,872.[5] The Secretary identified the hazard as the potential of a catastrophic failure of the reactor vessel as operated by Arcadian, and identified three conditions over which Arcadian could reasonably be expected to exercise control. The judge, however, determined that the three conditions the citation identified as contributing to the hazard were separate hazards, and that Arcadian was "being cited for failing to take recognized precautions that would have reduced the risk of catastrophic failure/explosion, whether or not those precautions would have prevented the failure/explosion which occurred on July 29, 1992."

The judge erred as a conceptual matter in holding that the three separate hazards were created by the failure of the employer to utilize the three abatement methods identified by the Secretary. The hazard is not defined in terms of the absence of a particular abatement method. *Morrison-Knudsen Co./ Yonkers Contracting Co.*, 16 BNA OSHC 1105, 1121-22, 1993-95 CCH OSHD ¶30,048, p.41,279 (No. 88-572, 1993)(hazard was excessive levels of

[4] Arcadian argues that the general duty clause must be "narrowly construed," and that the judge failed to do this, but does not suggest how the judge could have approached the issue differently, or what in particular made his approach to be other than "narrow." Because Arcadian has not supported its argument, we do not address it.

[5] In *Pelron,* the Commission defined the hazard "as practices, procedures or conditions which increase the likelihood of an explosion of EtO," a liquid flammable chemical compound. 12 BNA OSHC at 1835, 1986-87 CCH OSHD at p. 35,872 (emphasis original). Another example is *Well Solutions Inc.,* 17 BNA OSHC 1211, 1213, 1993-95 CCH OSHD ¶30,750, p.42,718 (No. 91-340, 1995), where "the hazard consists of conditions at a well site during a 'rod and tube job' that *increased* the likelihood of a well blowout and resulting fire"(emphasis original). *See also McLaughlin v. Union Oil Co*., 869 F.2d 1039, 1044(7th Cir. 1989)(finding that "hydrogen stress corrosion cracking in the [pressure] vessel that exploded was a hazard").

airborne lead being generated by ongoing bridge demolition work, not absence of protective clothing). A hazard is defined "in terms of the physical agents that could injure employees rather than the means of abatement." *Chevron Oil Co.,* 11 BNA OSHC 1329, 1331, n.6, 1983-84 CCH OSHD ¶ 26,507, p.33,722, n.6 (No. 10799, 1983).

In *Kelly Springfield Tire Co*., 10 BNA OSHC 1970, 1974, 1982 CCH OSHD ¶ 26,223, p.33,113 (No. 78-4555, 1982), *aff'd,* 729 F.2d 317 (5th Cir. 1984), the Commission found that the workplace was not free of a recognized hazard in that the "dust collection system was not operated or maintained in such a way as to protect employees from the danger of an explosion caused by the combination of oxygen, a combustible dust, and an ignition source in the enclosed space." Here, the Secretary has alleged that the urea reactor was not operated or maintained in a manner to protect employees from the danger of explosion caused by urea leaks that could erode the lining of the pressure vessel. That was the hazard in this case. The adequacy of the employer's work practices to reduce the risk of, or prevent the occurrence of, the hazard is a separate issue from the question of how the recognized hazard is defined. *Wiley Organics, Inc.,* 17 BNA OSHC 1587, 1592-93, 1995-97 CCH OSHD ¶ 31,035, p.43,276 (No. 91-3275, 1996), *aff'd without published opinion,* 124 F.3d 201 (6th Cir. 1997).

Arcadian recognizes that "stating a hazard in terms of the absence of abatement is, of course, error," but claims that the Secretary "insisted" on this formulation. Arcadian does not cite to and we are unable to find in the record any evidence that the Secretary had "insisted" on this formulation, but even if she had, the Commission does not have to adopt it. The Commission may define the hazard itself. See, e.g., *Davey Tree Expert Co*., 11 BNA OSHC 1898, 1899, 1983-84 CCH OSHD ¶ 26,852, p.34,399 (No. 77-2350, 1984) (Commission defined hazard after determining Secretary's definition is too broad). Nor do we find any merit in Arcadian's claim that the record must also prove industry recognition and employer knowledge that the absence of the pleaded abatement measure posed the hazard of the catastrophic failure. The Secretary's burden of proving a general duty clause violation has not changed. The Secretary establishes a violation by showing that the employer failed to free its workplace of a recognized hazard and that there exists feasible methods to abate or materially reduce the hazard.

(2.) Hazard Recognition

"A hazard may be recognized by either the individual employer itself or its industry." *Wiley Organics, Inc.,* 17 BNA OSHC at 1591, 1995-97 CCH OSHD at p.43,275. The record supports the judge's finding of Arcadian's recognition of the hazard. Arcadian argues that the reactor's explosion was a "freakish, unprecedented occurrence" in that no Stamicarbon-designed reactors like this one had ever failed and that failures of other reactors were "virtually unheard of." *See National Realty & Constr. Co. v. OSHRC*, 489 F.2d 1257, 1265 n.33 (D. C. Cir. 1973) ("If evidence is presented that a practice could eventuate in serious physical harm upon other than a freakish or utterly implausible concurrence of circumstances, the Commission's expert determination of likelihood should be accorded considerable deference by the courts.") However, the Commission has held that it is the hazard, not the specific incident that resulted in injury or might have resulted in injury, that is the relevant consideration in determining the existence of a recognized hazard. *Kelly Springfield Tire Co*., 10 BNA OSHC at 1973, 1982 CCH OSHD at p. 33,113. Thus, even if the reactor had not exploded, whether employees were exposed to the hazard of an improperly operated reactor could still be before us. Moreover, "[t]he goal of the Act is to prevent the first accident, not to serve as a source of consolation for the first victim or his survivors." *Mineral Industries & Heavy Constr. Group v. OSHRC*, 639 F.2d 1289, 1294 (5th Cir. 1981); *see also McLaughlin v. Union Oil Co.,* 869 F.2d 1039, 1045 (7th Cir. 1989)(court rejected argument that pressure vessel explosion was a "freak accident" based on judge's factual determination that hazard of hydrogen stress corrosion cracking in a vessel was widely recognized even though no rupture or explosion had occurred before).

We find that the record does not support Arcadian's contention that it reasonably believed the urea reactor could not fail. Arcadian does not dispute that the industry practice is to shut down a reactor once a leak is detected, but argues that the practice "stems not from fear of failure, but the fear that, without a shutdown, the liner could be damaged, risking a long and costly repair." Arcadian argues that, prior to the explosion, plant manager Ernie Elsbury had not read or heard of a urea reactor rupturing, and believed that a rupture would only result in expensive repairs, and that urea unit superintendent Dana Baham was not aware

of any catastrophic failure of a urea reactor. However, the record shows that other Arcadian managers were aware of reactor ruptures and the hazard they posed to employees. Urea operator Sittig testified that operator supervisor Richard Bartley told him that "[t]he only thing you have to worry about is if that reactor ever leaks or if it ever blows up. You won't be here to tell about it." Sittig and Bartley discussed an explosion that happened overseas either right before or right after the 1989 reactor leak, and Bartley told him that a reactor had exploded and leveled everything within 200 square yards. Bartley had heard of the rupture of a urea reactor in South America. Bartley also knew that a pressure release from the reactor could cause damage to equipment and personnel, and was aware that anhydrous ammonia, contained in the urea reactor, was an inhalation hazard, which could cause chemical burns or, in sufficient quantities, death. Arcadian Reliability and Engineering Manager Ed Anderson knew prior to working with Arcadian in 1990 that the components of a urea reaction can be corrosive to stainless steel as well as carbon steel. Anderson was aware of a stainless steel lined multilayer urea reactor that failed in 1976 in Chattanooga, Tennessee, where ammonia was released and the reactor had to be scrapped. He was also aware of failures in South Africa and Columbia.

Arcadian also relies on brochures from the manufacturer of the reactor, CB&I, to establish that the reactor's failure could not reasonably be anticipated. However, neither document states that the carbon steel walls could withstand corrosion. Instead respondent's exhibit 18 states that "[s]hould a fracture occur in any layer, the load is shifted to the other layers." Respondent's exhibit 171 states: "If a leak should develop in the inner shell through exposure to corrosive elements or other operating conditions beyond the designed capability, the fluid would be safely vented for immediate detection and corrective action - before a serious failure could occur."

Arcadian claims that "there is no evidence that Stamicarbon . . .ever warned the industry that employee safety would be at risk from not shutting down because a reactor could fail catastrophically." This claim is undercut by Government Exhibit 104, a copy of a Stamicarbon Leak Detection specification, obtained as part of a document request from Arcadian. While it does not state that the reactor could fail catastrophically, the specification

does state that the carbon steel "must not come into contact with the corrosive medium inside the vessel" because it "causes serious corrosion of the carbon steel, so that a hazardous situation would arise." It also states that the urea from inside the vessel "tends to crystallize and to block the leak-detection system. Then the carbamate cannot dissociate any longer and the carbon steel vessel wall will corrode with all the hazardous consequences this has."

Arcadian cites to the testimony of the Secretary's experts LeVine and Terence Lynch to support its argument. LeVine was a fire protection, and later, a loss prevention manager for Olin, the company that sold the facility to Arcadian. Arcadian claims that LeVine did not write or recommend procedures directing operators to shut down the reactor if a leak appeared in a weep hole but LeVine testified that Olin had always followed "from day one" the instruction that the reactor is to be shut down if a leak appeared through the weep holes. While Arcadian also claims that Lynch's former employer, CIL, operated a titanium-lined urea reactor with leaks for three years, Lynch testified that when a leak was detected, they did not continue operating the reactor vessel but instead shut it down to repair it. Arcadian's claim that the reactor was returned to service even though the source of the leak had not been determined is misleading at best. Lynch's testimony and his report submitted into evidence show that, although CIL could not pinpoint the exact source of the leak, CIL repaired the general area of the lining that the leak was emanating from. Lynch testified that they continued operating their vessel because, "based on our inspection procedures and monitoring, we were not concerned we were going to blow it up."

The Secretary also presented testimony from experts on similar pressure vessels used in industries other than urea manufacturing recognize that, to prevent an explosion, a pressure vessel must be shut down whenever a leak is detected.[6] Arcadian challenges the relevancy of

[6] Arcadian argues that Foster, Grelecki and LeVine do not have experience in the urea manufacturing industry. Arcadian argues that while Lynch has experience in the urea industry, that experience was not in areas relevant to the issues here. We affirm the judge's finding that the testimony of Foster, Grelecki, LeVine and Lynch was properly admitted pursuant to Federal Rule of Evidence 702. The Commission has rejected Arcadian's argument that, for his testimony to be admissible, the expert must have experience in the same industry. In *Beverly Enterprises,* 19 BNA OSHC 1161, 1187, 2000 CCH OSHD ¶ 32,227, p.48,978 (No. 91-3144, 2000)(consolidated), the Commission held:

this "recognition" since it was not specific to the urea manufacturing industry. This claim is without merit. Where a practice is plainly recognized as hazardous in one industry, the Commission may infer recognition in the industry in question. *Kelly Springfield Tire Co. v. Donovan*, 729 F.2d 317 (5th Cir. 1984). As was discussed, *supra*, the Secretary introduced several exhibits as well as expert testimony demonstrating that those knowledgeable about the operation of similar pressure vessels not only recognize that leaking vessels may explode, but also that leaking pressure vessels must be shut down and examined to determine the source of the leak. [7]

> The standard for industry recognition is not the knowledge or understanding of experts directly associated with the specific industry in question. So long as the experts who regard the practice or work operation as hazardous are familiar with the conditions in the industry, the Commission does not require that they be employed in that industry.

Beverly, citing Kelly Springfield Tire Co., 10 BNA OSHC at 1973, 1982 CCH OSHD at p. 33,113. While Arcadian challenges the experts' background in the specific field of urea manufacturing, it does not challenge the fact that they have at least some familiarity with conditions in the urea industry.

[7] We note that Arcadian challenges under *Daubert v. Merrell Dow Pharmaceutical, Inc.*, 509 U.S. 579 (1993) the admissibility of the Secretary's experts' testimony regarding the reports they prepared for the Secretary on their investigations of the events that led up to the catastrophic failure of the urea reactor. The experts also gave their opinions on the industry's recognition of the explosion hazard. *Daubert* requires judges to exercise a "gatekeeping" role by determining when expert testimony is sufficiently reliable to be presented to a jury, and sets forth several criteria to determine whether an expert's proffered testimony is sufficiently reliable to warrant admission: whether the theory or technique can be tested; whether it has been subject to peer review and published; the known or potential error rate; and the degree of acceptance within the relevant scientific community. While *Daubert* refers to scientific knowledge, the Court later made clear that its holding was intended to refer also to technical and other specialized knowledge in *Kumho Tire Co. v, Carmichael*, 526 U.S. 137, 149 (1999). Here, there is no such scientific or technical dispute. The record is clear that the explosion was caused by the ammonium carbamate's corrosion of the reactor's lining. Arcadian did not argue that *Daubert* would exclude the experts' testimony regarding industry recognition of the hazard.

The respondent claimed as error the Secretary's introduction of a number of published articles that the judge relied on to find industry recognition that a leak in pressure vessels of the type used by Arcadian presented a hazard of explosion. However, we do not rely upon these publications, since we find record evidence, independent of these publications,

Lynch testified that any operator of a urea reactor should recognize the inherent hazards associated with any pressure vessel. Specifically, if the pressure-containing outer shell becomes corroded from a leak in the inner liner, it may no longer be able to contain its pressurized contents, and a sudden release of energy and the contents of the vessel may result. Lynch's testimony was seconded by Dr. Grelecki, who testified that, based on his experience evaluating between 15 to 20 accidents involving high pressure vessels, members of the urea industry do, or should, recognize the explosive potential of a multi-layer reactor solely on the basis of the physics and chemistry involved.[8] Similarly, LeVine testified that, prior to the 1992 explosion, ruptures of multi-layered pressure vessels had been discussed in at least three seminars of the American Institute of Chemical Engineers (A.I.Ch.E). LeVine testified that he and others in the field recognized the rupture hazard based on available literature published in Ammonia Plant Safety. Arcadian admits that it is a member of the A.I.Ch.E., attends its Ammonia Symposium and Annual Safety Meetings, and maintains copies of Ammonia Plant Safety on file.

Significantly, Arcadian contends that a leak does not suggest that a pressure vessel is compromised unless it involves the forceful ejection of urea. This contention fails to consider urea unit superintendent Baham's testimony that "if you've got a weep hole problem, then you need to shut the urea reactor down." *See* Willful discussion in Section III, *infra.* It also overlooks the fact that several weep holes were plugged and nonfunctional. Other weep holes were not accessible without use of a ladder, and Arcadian never advised its operators to check whether those weep holes were clear. Arcadian's failure to properly maintain the weep holes essentially disabled the very system designed to provide warning of potential vessel failure. Certainly, having failed to ensure the integrity of the weep holes, Arcadian cannot

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establishing that the respondent recognized the existence of the hazard here. Therefore, it is unnecessary to resolve the question of whether the challenged publications meet the criteria for "learned treatises" under Federal Rule of Evidence 803(18).

[8] Arcadian argues that Dr. Grelecki admitted in his deposition that, given the CB&I document, it was not reasonable for Arcadian to have recognized that the vessel could fail. However, at the hearing Dr. Grelecki testified that he had misunderstood the questions and answered incorrectly.

now be heard to argue that there was no recognized hazard due to the failure of the weep holes to forcefully eject urea.

In sum, we find that the record clearly shows that Arcadian, through a number of key management officials, recognized the hazard presented by the improperly operated urea reactor. The record also establishes industry recognition of the same hazard.

(3.) Harm

There is no question that the hazard of the pressure vessel explosion caused serious physical harm. Arcadian employees Poullard-Smith and Sittig required hospitalization for several days due to their injuries. *See Morrison-Knudsen Co./ Yonkers Contracting Co*., 16 BNA OSHC at 1122, 1993-95 CCH OSHD at p.41,279 ("When evaluating whether the *hazard* presented a likelihood of serious physical harm, we do not inquire into whether the absence of the *abatement method* was what presented the likelihood; we remain focused on the hazard alone, and a hazard is likely to cause serious physical harm if the likely consequences of employee exposure would be serious physical harm"(emphasis original)).

Arcadian's arguments to the contrary are completely lacking in merit. Arcadian's claims that the general duty clause speaks of "hazards" likely to cause serious harm, not "accidents." Here, however, the accident and hazard are the same: the explosion of the leaking urea reactor. The Secretary denies Arcadian's argument that she is reading the "likely to cause" factor out of the general duty clause, noting that she is following the Commission's precedent in *Waldon Healthcare Center*, 16 BNA OSHC 1052, 1060, 1993-95 CCH OSHD ¶ 30,021, p. 41,153 (No. 89-2804, 1993) that, if an accident occurs, the results are likely to cause death or serious physical harm. Arcadian responds that the Secretary's approach would eliminate the "significant risk" element of a hazard that the Commission explained in *Kastalon, Inc.*, 12 BNA OSHC 1928, 1932, 1986-87 CCH OSHD ¶27,643, p.35,974 (No. 79-3561, 1986)(consolidated). In *Kastalon*, the employees were exposed to a chemical identified as "MOCA," a probable human carcinogen. The Commission found that the Secretary did not establish that the employees were exposed to a significant risk of harm because the record did

not establish the exposure levels that presented a cancer risk. Here, however, there is no question of exposure level. As the Commission noted in *Waldon:*

> No one questions whether an explosion, fire, or 20-foot fall can injure employees, i.e., whether these events, if they occur, pose a significant risk of causing death or serious physical harm. The question in those cases usually involves whether the hazard exists, i.e., whether the conditions that exist in the workplace can lead to the hazardous event.
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> *Waldon*, 16 BNA OSHC at 1060, n.5, 1993-95 CCH OSHD at p.41,153, n.5.

The Secretary notes that the Fifth Circuit has already rejected Arcadian's argument that the Secretary must prove a "significant risk" of a catastrophe in *Kelly Springfield Tire Co. v. Donovan*, 729 F.2d 317, 322-25 (5th Cir. 1984). Arcadian claims that "in light of subsequent legal developments and upon reconsideration, the Fifth Circuit will no longer follow that decision, " but fails to provide us with any support for this extraordinary claim.

(4.) Feasibility of proposed abatement measures

"The Secretary must specify the proposed abatement measures and demonstrate both that the measures are capable of being put into effect and that they would be effective in materially reducing the incidence of the hazard." *Beverly*, 19 BNA OSHC at 1190, 2000 CCH OSHD at p.48,981. Feasible means of abatement are established if "conscientious experts, familiar with the industry" would prescribe those means and methods to eliminate or materially reduce the recognized hazard. *Pepperidge Farm, Inc*., 17 BNA OSHC 1993, 2032, 1995-97 CCH OSHD ¶ 31,301, p. 44,014 (No. 89-0265, 1997), *citing National Realty & Constr. Co. v. OSHRC*, 489 F.2d 1257 (D.C. Cir. 1973). "[T]he Secretary need only show that the abatement method would materially reduce the hazard, not that it would eliminate the hazard. The Secretary is therefore not required to show that the abatement method's absence was the *sole* likely cause of the serious physical harm." *Morrison-Knudsen*, 16 BNA OSHC at 1122, 1993-95 CCH OSHD at p. 41,279 (emphasis original). There were three methods of abatement identified by the Secretary, which we will discuss in turn.

a. Shutting down the reactor upon the detection of leaks[9]

[9] The citation states as follows:

Shutting down the reactor was a feasible method of materially reducing the hazard. It is undisputed that Arcadian and the fertilizer industry recognized the feasibility of shutting down a urea reactor until the source of the leak was identified, and it was Arcadian's policy to shut down a leaking reactor. Arcadian argues that shutting down the reactor after the June leak would not have materially reduced the explosion hazard because an inspection of the liner at the level where the leak appeared, C-5, was not where the leak was occurring. Rather, the C-5 leak actually reflected corrosion products from the C-7 level, which was determined after the explosion to be the locus of the failure. Yet, Arcadian has not shown why the search for the leak would have been limited to the C-5 level. The focus is on abating the recognized hazard, which may not have prevented the incident that resulted in the injury. *See Kelly Springfield Tire Co*., 10 BNA OSHC at 1973, 1982 CCH OSHD at p. 33,113 ("it is the hazard, not the specific incident that resulted in injury . . . that is the relevant consideration in determining the existence of a recognized hazard"). Moreover, if the source of the leak was not found at the C-5 level, it is reasonable to suppose that the inspection of the reactor would have been expanded, given the manner in which the weep holes accessed the annulus, the open space between the carbon steel outer liner and the stainless steel liner. For it was possible that a leak in the stainless steel liner might not be able to exit at the closest weep hole (possibly clogged due to corrosion) and would therefore migrate in the open space and exit through another weep hole.

b. Implementing an adequate monitoring system to detect leaks[10]

(a) On or about July 28, 1992, the urea manufacturing operation utilizing a pressure vessel (R-2 Reactor) was not shut down upon previous detection of leaks in the liner of the vessel.

Feasible abatement methods to correct this condition may include, but are not limited to, shutting the reactor down upon detection of a leak, and identifying the location/cause of the leak by, e.g., radiographic examination of the vessel walls.

[10] The citation states as follows:

(b) On or about July 28, 1992, management had not implemented an adequate program to ensure that the R-2 vessel's leak detection system (weep holes and leak detection holes) was properly monitored for leaks of decomposition gases (CO2 and ammonia) or

The judge determined that the Secretary failed to establish that the use of manometers to detect escaping gases would materially reduce the hazard, noting that "no evidence was introduced to show that escaping ammonia gases caused such damage [to the vessel], or that a gas leak would develop into a hazardous product leak so quickly that detection of a leak at the gaseous stage was essential to employee safety," or that Arcadian's industry recognized that anything more than the visual monitoring system it employed was required. He also found that the Secretary failed to establish that the visual inspection of the weep holes via platforms was necessary for the safe operation of the reactor. The judge found that Arcadian's weep hole monitoring system was adequate and provided notice that the reactor was leaking, and that a uniform recording system would not materially reduce the hazard since "industry practice is to shut down any pressure vessel upon detection of a leak, such leaks should be reported and acted on immediately, rendering record keeping largely irrelevant." However, the judge found that ensuring that the leak detection system's weep holes were clear of obstruction would materially abate the hazard because "failure of the leak detection system may lead to corrosion of such vessel's outer shell and the eventual catastrophic failure of the vessel." Based on Lynch's testimony, the API Pressure Vessel

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leaking product (ammonia carbamate).

1. Inconsistent recordkeeping and review practices were used by employees involved in the inspection of the R-2 vessel's leak detection system.

2.Means to thoroughly inspect each element of the leak detection system so as to detect escaping gases, leaking product, or a clogged weep hole/leak detection hole, had not been provided.

Feasible abatement methods to correct this condition may include, but are not limited to, 1) installing manometers on each weep hole/leak detection hole to automatically detect escaping gases; 2) constructing sufficient platforms around the R-2 Reactor to allow direct employee access to all of the weep holes/leak detection holes; 3) implementing appropriate administrative controls to ensure that operators inspect each weep hole/leak detection hole on a periodic basis for conditions indicating a possible leak in the vessel liner, and that operators document the findings of the inspection on a consistent basis using a uniform recording system; 4) drilling/rodding/steaming out clogged weep holes/leak detection holes to ensure that the leak detection system functions according to its design criteria, i.e., that the weep holes/leak detection holes communicate freely to the vessel liner.

Code 510, Stamicarbon specifications and safety literature in the industry, the judge found that "the industry recognized the need to ascertain that all weep holes are open and in communication with each other on a regular basis."[11] He found that the record establishes that the weep hole system should be inspected during turnarounds and upon the detection of a leak, by forcing steam through the weep holes, to assure that leaking urea has not crystallized in the annulus, and that all weep holes are clear. The last time the weep hole system was tested was following the repairs in 1989, and no similar test was conducted during Arcadian's 1991 inspection of the vessel or following either the January or June 1992 leaks.

The record supports the judge's findings. The Secretary has not challenged the judge's determination that the use of manometers to detect escaping gases, platforms to inspect the weep holes, or the adequacy of Arcadian's monitoring program would not materially reduce the hazard. Arcadian does not challenge the judge's finding that it was feasible to inspect the weep holes to confirm that they were clear of obstruction in order to maintain the functionality of the weep hole system. Clearly, the weep hole system must be functional in order to detect the presence of leaks.

c. Conduct adequate inspection, maintenance, and repairs of the liner[12]

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[11] The judge viewed the case as presenting the failure to use these abatement methods as recognized hazards. Since we view them only as abatement methods, the issue is not whether the abatement method was recognized but rather whether it was feasible. Therefore, recognition is relevant only insofar as industry recognition of the abatement method reflects on its feasibility.

[12] The citation states as follows:

(c) On or about July 28, 1992, the Arcadian Corporation operated a pressure vessel (R-2 Reactor) utilizing a stainless steel liner that had been improperly /inadequately repaired, inspected, and maintained.

Feasible abatement methods to correct this condition may include, but are not limited to, complying with appropriate industry codes such as API 510, ASME, volume VIII, to ensure that critical welds on the pressure vessel are performed according to design specifications, meet industry standards, and are subject to, e.g., non-destructive testing methods prior to the vessel's return to service.

The judge found that annual inspections were required for Arcadian's reactor because the reactor's liner was approaching retirement thickness.[13] He also found, based on Lynch's testimony, that the urea industry recognizes that the non-destructive dye penetrant testing on repair welds to determine if they are improper or inadequate is necessary due to the corrosive nature of urea production. Arcadian challenges the need for annual inspections, noting that Stamicarbon recommended a two-year interval in May 6, 1988. After the 1989 repair, however, Schoeller-Bleckmann's final report recommended that the reactor be inspected "one year latest." The judge found that "[i]t is undisputed that regular inspection of a urea reactor is performed to determine whether corrosion has occurred, which might allow the product to penetrate the stainless steel liner and reach the carbon steel shell."

The record supports the judge's findings. Arcadian does not challenge the feasibility of using non-destructive dye penetrant testing on critical welds. We therefore find that the Secretary has established feasibility of the proposed abatement measures.

(5.) Do the judge's findings contravene section 9(c) of the Act?[14]

Arcadian argues that it cannot be cited for the "discrete actions" it took during the 1991 reactor repair because the citation is barred by the six month statute of limitations set forth in Section 9(c) of the Act. The claim is without merit. The Secretary did not cite Arcadian for discrete actions taken in 1991 but for a violation that was still occurring "on or about July 28, 1992." The 1991 repair work began the period of the alleged noncompliance, but it did not end there. The record shows that Arcadian continued to operate the vessel in an allegedly unsafe manner. The Secretary may cite an uncorrected violation six months from

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[13] On review, the Secretary disputes the judge's finding that Dana Baham, who inspected the reactor in 1991, was not unqualified to inspect it under the American Petroleum Institute ("API") 510 Pressure Vessel Inspection Code. We do not reach this issue because it is irrelevant to the issue of whether it was feasible for Arcadian to inspect the reactor in conformity with appropriate industry codes, including the API 510.

[14] Section 9(c) of the Act, 29 U.S.C. § 658(c), provides:
No citation may be issued under this section after the expiration of six months following the occurrence of any violation.

the date the Secretary discovers, or reasonably should have discovered, the facts necessary to issue the citation. *Kaspar Electroplating Corp.,* 16 BNA OSHC 1517, 1519, 1993-95 CCH OSHD ¶ 30,303, p.41,755 (No. 90-2866, 1993), *citing Johnson Controls, Inc.*, 15 BNA OSHC 2132, 2136, 1991-93 CCH OSHD ¶ 29,953, p.40,965 (No. 89-2614, 1993); *see also General Dynamics Corp., Electric Boat Div.*, 15 BNA OSHC 2122, 2127, 1991-93 CCH OSHD ¶ 29,952, p.40,956 (No. 87-1195, 1993) The Secretary discovered the general duty clause violation at the time of the explosion on July 28, 1992, and cited it within six months of that event.

II. Whether Section 5(a)(1) Was Preempted By the Process Safety Management Standard.

Finally, Arcadian argues that it cannot be cited for violating section 5(a)(1) because coverage of the condition cited here was preempted by 29 C.F.R. § 1910.119(j) of the Process Safety Management ("PSM") standard. [15] The PSM standard, which governs the management of hazards associated with processes using highly hazardous chemicals, was issued by OSHA as a final rule on February 24, 1992, with an initial effective date of May 26, 1992. 57 Fed. Reg. 6356 (Feb. 24, 1992). After the final rule was published, OSHA "received a number of requests asking OSHA to reconsider the 90-day effective date for certain provisions in the standard" and "received petitions requesting an administrative stay of certain provisions of the final rule," including paragraph (j). According to OSHA, the petitioners claimed that more time was needed because of the rule's extensive written program requirements. 57 Fed. Reg. 23060 (June 1, 1992). While OSHA decided that no extension of time was warranted for some of the paragraphs, it found that more time was necessary to evaluate the compliance date petitions for four of the paragraphs, including paragraph (j). Effective May 27, 1992, one day after the original effective date of the standard, OSHA granted an "administrative stay" of the four paragraphs until August 26,

[15]OSHA Deputy Director of Compliance H. Berrien Zettler agreed with Arcadian's counsel that the written procedures required by section 1910.119(j)(2) would include the monitoring of weep holes, Arcadian's training for process and maintenance activities would be covered by (j)(3), Arcadian's reactor inspection and testing procedures would be covered by (j)(4), and the alleged evidence of leaks would be an indication that the reactor was operating "outside acceptable limits" and would thus be covered by (j)(5).

1992, in order to evaluate the merits of the petitions. It requested public comment on whether OSHA needed to further stay the compliance dates of those provisions. *Id.* OSHA expected "that employers will continue to expedite their efforts to fully comply with all of the provisions of the standard" in spite of the stay, but stressed that "during the stay of paragraph[ ] . . . (j), OSHA will continue to protect employees exposed to highly hazardous chemicals in their workplace by using the general duty clause of the Occupational Safety and Health Act of 1970." *Id*. The stay did not affect settlement agreements in effect at the time of the stay as well as pending enforcement actions. *Id*. On August 26, 1992, OSHA decided that the original compliance date of May 26, 1992 was feasible and that an extended administrative stay of the paragraphs was "neither necessary nor appropriate." It announced that the PSM paragraphs would be effective again on August 27, 1992. 57 Fed. Reg. 38600 (August 26, 1992). The reactor at issue exploded while the stay was in effect. Arcadian claims that the administrative stay was not legally effective because it was not accomplished through the notice and comment rulemaking procedures of the Administrative Procedure Act ("APA") and, therefore, that the PSM standard was in effect at the time of the explosion. [16] We discern little basis for Arcadian's claim.

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[16] The APA provides, in pertinent part:

5 U.S.C. § 553. Rule making

. . .

(b) General notice of proposed rulemaking shall be published in the Federal Register, unless persons subject thereto are named and either personally served or otherwise have actual notice thereof in accordance with law. . . .

Except when notice or hearing is required by statute, this subsection does not apply-

(A) to interpretive rules, general statements of policy, or rules of agency organization, procedure, or practice; or

(B) when the agency for good cause finds (and incorporates the finding and a brief statement of reasons therefor in the rules issued) that notice and public procedure thereon are impracticable, unnecessary, or contrary to the public interest.

. . .

(d) The required publication or service of a substantive rule shall be made not less than 30 days before its effective date, except . . .

(3) as otherwise provided by the agency for good cause found and published with the rule.

If we were to view the stay order delaying implementation of the PSM standard as an amendment to the standard and thus a substantive, not procedural, rule,[17] as Arcadian argues, the record shows that the Secretary had "good cause" under section 553(b)(B) for not providing notice-and-comment prior to issuing the stay.[18] Generally, "[t]he mere existence of deadlines for agency action . . . [can] not in itself constitute good cause for a [section] 553(b)(B) exception." *United States Steel Corp. v. EPA,* 595 F.2d 207, 213 (5th Cir. 1979). Thus, the Secretary cannot rely on the fact that the standard was soon to go into effect as an excuse for not proceeding with notice and comment rulemaking procedures. In this case, however, it does not appear that it was the deadline for agency action that motivated the Secretary to issue the stay without notice and comment rulemaking since the stay was issued

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[17] *See, e.g., Mt. Diablo Hospital Dist. v. Bowen*, 860 F.2d 951, 956 (9th Cir. 1988) ("Rules that '*effect a change* in existing law or policy' are subject to notice and comment rulemaking requirements of section 553 [of the APA]" (emphasis in original). The APA defines a "rule" and "rulemaking" as follows, 5 U.S.C. § 551(4)-(5):

(4) "rule" means the whole or a part of an agency statement of general or particular applicability and future effect designed to implement, interpret, or prescribe law or policy or describing the organization, procedure or practice requirements of an agency and includes the approval or prescription for the future of rates, wages, corporate or financial structures or reorganizations thereof, prices, facilities, appliances, services, or allowances therefor or of valuations, costs, or accounting, or practices bearing on any of the foregoing;

(5) "rulemaking" means agency process for formulating, amending or repealing a rule.

[18] The Secretary claims that she did follow notice and comment procedures. However, the notice and comments she solicited were not for the initial stay but for whether OSHA should "further stay" the compliance dates for the stayed provisions. *See* 57 Fed. Reg. at 23060. *Post hoc* comment alone does not "cure" an agency's failure to follow section 553 of the APA's procedures. *New Jersey v. EPA*, 626 F.2d 1038, 1049 (D.C. Cir. 1980). The Secretary also argues that "Arcadian's own trade association, the Fertilizer Institute, submitted comments to OSHA in response to the notice, seeking a further extension of the stayed provisions' effective dates." However, the Secretary does not explain how the Fertilizer Institute's participation in the comment period after the stay had already gone into effect would address Arcadian's claim that proper notice-and-comment procedures were not followed. Furthermore, the Fertilizer Institute does not necessarily represent Arcadian's interests. *See Caterpillar Tractor Co.*, 12 BNA OSHC 1768, 1769, 1986-87 CCH OSHD ¶27,554, p.35,785 (No. 80-4061, 1986)("Some members of a trade association may have interests different from others with respect to the issues in a particular lawsuit, so the association's participation in a case does not guarantee that the interests of all of its members were represented or protected.")

after the standard had already gone into effect. As discussed in the June 1, 1992 notice, the Secretary issued the 90-day administrative stay of a standard that went into effect one day earlier to investigate several petitioners' requests for additional time to comply with the PSM standard's provisions. *Compare Council of the Southern Mountains, Inc. v. Donovan,* 653 F.2d 573, 580-582 (D.C. Cir. 1981)(Secretary had "good cause" to dispense with notice-and-comment in deferring implementation of regulations where agency was not being intentionally dilatory and rule's implementation date deferred for relatively short period of time).[19] Furthermore, to hold that section 5(a)(1) was inapplicable during the stay period would suggest that employees were totally unprotected from the cited hazard during the stay period, since any attempt by the Secretary to enforce the stayed standard would certainly have resulted in serious notice problems to employers.

Even if we were to find that the Secretary failed to comply with the APA's notice-and-comment requirements, we would find any error to be harmless.[20] *See Natural Resources Defense Counsel v. EPA*, 725 F.2d 761, 767 (D.C. Cir. 1984)(unnecessary to address extent to which agencies possess general equitable power to stay regulations where no party has alleged sufficient injury from the stay at issue to guarantee that an actual controversy exists); *U. S. Steel Corp. v. EPA*, 595 F.2d at 215 (doctrine of harmless error where the agency failed to comply with the APA requirement of pre-promulgation notice-and-comment is to be used only when a mistake of the administrative body does not prejudice a party).

Arcadian claims that it was prejudiced by being held under the general duty clause to a higher standard than what the PSM standard would require. The employer relies upon the judge's finding that Arcadian violated the general duty clause by not performing in 1991 dye penetrant testing on repair welds made inside the reactor, the Secretary's endorsement of that

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[19] The Secretary's failure to explicitly include a finding of good cause is not fatal to use of the exception. *See Action Alliance of Senior Citizens of Greater Philadelphia v. Bowen*, 846 F.2d 1449, 1455 n. 7 (D.C. Cir. 1988).

[20] This is not to suggest that any error by the Secretary in staying the standard was without legal remedy. For example, Arcadian could have challenged the stay if it had an interest in having the standard immediately enforced. Here, however, Arcadian lacks standing to challenge the stay during this enforcement action.

finding, and the Secretary's assertion that the API 510 Pressure Vessel Inspection Code was binding on Arcadian. However, Arcadian does not explain why the use of dye penetrant testing or the application of API 510 could not fit within 29 C.F.R. § 1910.119(j)(4)(ii)'s requirement that the inspection and testing of pressure vessels should "follow recognized and generally accepted good engineering practice." Arcadian claims that "in adopting Paragraph (j), the Secretary decided expressly to not require employers to follow particular codes and standards." However, in the preamble to the PSM standard, the Secretary states that the intent "is to make sure that process equipment is inspected and tested properly, and that the inspections and tests are performed on accordance with appropriate codes and standards." 57 Fed. Reg. at 6390. The use of dye penetrant testing and of API 510 could thus be permitted under the PSM standard if they are found to be "appropriate." We therefore reject Arcadian's claims regarding the stay. We find nothing in the record to indicate that she acted improperly, or that Arcadian was in any way prejudiced or injured as the result of the course the Secretary chose.[21]

Arcadian makes several minor arguments that may be quickly resolved. It notes that section 6(b)(4) of the Act prohibits the Secretary from delaying a standard's effective date for more than 90 days, and claims that the stay stretched the PSM standard's effective date to 180 days. However, the Secretary was technically in compliance because the full standard was in effect for one day, May 26, 1992, before the stay was scheduled to begin. Arcadian also claims that the stay "was merely an administrative decision to forebear from enforcement." The notice of the stay does not mention that the Secretary intended to forebear from enforcement but instead clearly states that she would "continue to protect employees exposed to highly hazardous chemicals in their workplace by using the general duty clause"

[21] Arcadian also argues that the stay was ineffective because the "only way an effective date of a substantive rule may be rendered ineffective is through a revocation," and cites to *Ohio-Sealy Mattress Co*., 11 BNA OSHC 1377, 1383 n.11, 1983-84 CCH OSHD ¶ 26,528, p.33,807, n.11 (No. 79-5600, 1983), for support. However, in *Ohio-Sealy,* the Commission did not hold that the Secretary may only change the effective date of a standard through a revocation of that standard. Rather, it found that there was no clear and manifest intent in a new cotton dust standard to unconditionally revoke the prior one.

of the Act. 57 Fed. Reg. 23060. Arcadian further argues that the PSM standard became an "advisory standard" as a result of the stay and that therefore the PSM standard still preempted section 5(a)(1). An example of an advisory standard is one in which the word "should" is used instead of the word "shall." It is not required for an employer to follow an advisory standard. *See, e.g., Farthing & Weidman, Inc*., 11 BNA OSHC 1069, 1070, 1983-84 CCH OSHD ¶26,389, p.33,490 (No. 78-5366, 1982); *A.Prokosch & Sons Sheet Metal*, 8 BNA OSHC 2077, 2080-81, 1980 CCH OSHD ¶ 24,840, pp. 30,628-29 (No. 76-406, 1980). Here, the stay did not change the language of the PSM standard. The PSM standard remained a mandatory one.

III. Does the record support a finding the the violation was wilful?

A willful violation is one committed "with intentional, knowing or voluntary disregard for the requirements of the Act or with plain indifference to employee safety." *Williams Enterp., Inc*., 13 BNA OSHC 1249, 1256, 1986-87 CCH OSHD ¶ 27,893, p. 36,589 (No. 85-355, 1987). "[I]t is well settled that the Secretary has a more stringent and more difficult burden of proof to show willfulness where the employer is charged with a violation of section 5(a)(1) than she does where failure to comply with a specific standard is concerned." *Eric K. Ho*, 20 BNA OSHC 1361, 1378, 2002 CCH OSHD ¶ 32,692, pp. 51,587-88 (No. 98-1645, 2003)(consolidated), *petitions for review filed*, No. 03-60958 (5th Cir. Nov. 14, 2003), No. 03-61004 (5th Cir. Nov. 28, 2003). "The Secretary must not only show that the employer had knowledge that a hazardous condition existed but must also adduce evidence that the employer intentionally disregarded or was indifferent to employee safety with respect to the hazard in question." *Ho*, *citing General Dynamics Land Systems Div., Inc*., 15 BNA OSHC 1275, 1287, 1991-93 CCH OSHD ¶ 29,467, p. 39,759 (No. 83-1293, 1991), *aff'd without published opinion*, 985 F.2d 560 (6th Cir. 1993).

In finding willfulness,[22] the judge noted that he had the opportunity to observe the demeanor of supervisors Baham and Bartley for several weeks, and that his "observations and evaluation of their answers indicate that they were indeed sincere in their belief that they acted responsibly in this case." The judge also rejected the Secretary's argument that Arcadian kept the reactor running because it was attempting to make as much urea as possible at the time of the leaks in order to take advantage of a good market price. The judge found that Arcadian's "management, Baham especially, had a genuine concern for the safety of their co-workers."

However, the judge found that Arcadian's management exhibited "plain indifference" in its failure to follow the industry practice of shutting down the R-2 reactor upon the detection of a leak in the vessel's liner. The judge found that Baham and Bartley were "unreasonable" in attributing twice in a six month period weep hole discharges to sources other than leaks from the liner, and that they "should have assumed" that the weep hole discharges actually indicated one or more leaks. The judge also found that Arcadian "was unreasonable in relying on Baham and Bartley's steam test of the C-5 leak detection tubes, which they believed established that those weep holes were not intended to monitor the annulus or communicate with the other weep holes." The judge found that Arcadian's failure to investigate the "obvious alternative" that adjacent weep holes were clogged constituted "plain indifference where, as here, the evidence clearly establishes that the entire leak detection system had not been tested since 1989." The judge noted the industry's recognition of the need to ascertain the functioning of leak detection systems. The judge found that these factors, and his "instinct based on over 18 years as a Commission judge," "tipped the scales in favor of the Secretary on the issue of plain indifference to employee safety."

We agree that Arcadian's conduct was willful. However, we base our willful finding on somewhat different reasoning. We conclude that Arcadian consciously disregarded a known duty with respect to the hazard in question and was plainly indifferent to employee safety.

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[22] The judge affirmed items (a) and (b) as willful but not item (c). As we noted earlier, the subitems were not separate charges.

The record shows that Arcadian knew, through its management, that the purpose of the weep hole system was to warn that the urea reactor's stainless steel lining was breached, and that the consequences of a breach would likely be death or serious physical harm to its employees; yet it disregarded the January and June 1992 leaks and continued to operate the reactor. Plant Manager Ernie Elsbury knew that the reactor's outer wraps were layered and that the reactor was designed to indicate a leak by material coming out of its weep holes before the layers were corroded. He testified that "[i]f you had a leak on a weep hole, that meant you had a breach in the liner" and that if the liner was not intact, "you ran the risk that the carbamate could get in contact with the carbon steel in the vessel" and that "you would eventually eat up all the wraps." He also testified that it was the wraps that kept the reactor from exploding.[23] However, Elsbury believed that the reactor would not get to that point because the carbamate "would be squirting out the weep holes," although he did not know that the weep holes could become clogged. Reliability and Engineering Manager Ed Anderson knew that the components of a urea reaction could be corrosive to stainless steel as well as carbon steel, that there was a risk of failure from continued corrosion of the carbon steel walls of the multilayer pressure vessel, and that the failure could be catastrophic.

Urea Unit Superintendent Dana Baham, in somewhat confusing testimony, agreed that he said in his sworn statement to OSHA that "there was a standard operating procedure that said, 'If you've got a weep hole problem, then you need to shut the urea reactor down'" and that the operators "operated and they have to operate it according to that procedure."[24] At the hearing, he stated that he was "not sure what they were taught, but that is definitely an

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[23] Elsbury later clarified that the reactor could "rupture into pieces" because "explode" meant to him "some chemical reaction occurring that makes it happen."

[24] Baham's sworn statement, as read into the record, continued that after the June 1992 leak began, the operators "needed to understand why I was diverting or asking them to divert from that procedure. So I did everything that I could to explain to them why we were still operating with a leak in the reactor. So did any operator ever come to me and say, 'Dana, we ought to shut this sucker down right now'? No, no. . . . So with this particular leak that we had had and the fact that I was asking them to run with it, I wanted to make sure that they understood why they were running with a leak like this as opposed to running with a normal weep hole leaking."

understanding of the operators."[25] However, Baham testified at the hearing that the standard operating procedure was "for one operator to see it, that operator to report to another operator, the A Operator. If the A Operator felt it necessary to shut down the plant, he would have shut it down. If he felt that he should report to a supervisor, he would report to a supervisor and then take the appropriate action." Baham claimed he did not know, prior to the 1992 accident, that a pressure vessel could come apart and fragment, but that it was "not something that I thought about." In answering why the reactor was shut down in 1989, Baham stated: "I had been around this business long enough to know that a leak detection system or a weep hole system was a telltale system of something that told you you had a problem, a breach of the liner. So on that basis, that was the thing to do." He agreed that if the C-5 filler patch was not full seal welded, the reactor's contents would migrate into the carbon steel "just the same way it did in 1989." He also knew that the liner was approaching the end of its useful life. Baham wrote that after the June leak, he knew that the liner would have to be replaced in 1993 "based upon our observations of possible liner problems around the C-5 weld in June of 1992."

Urea Area Supervisor Richard Bartley knew prior to June 14, 1992 (the date of the June leak), that "if we had a leak coming out of the weep holes, we would have looked at it and made plans to shut it down. . . . I think when you had something, it was serious." He "knew a leak of carbamate out of the reactor could damage the carbon steel," that the weep holes on the reactor were for detecting leaks, and that leaks should be detected as soon as possible. He knew that a pressure release from the reactor could cause damage to equipment and personnel, and was aware that anhydrous ammonia, contained in the urea reactor, was an inhalation hazard, which could cause chemical burns or, in sufficient quantities, death. In addition, he considered the temperature of the material inside the reactor (370 degrees) to be hazardous. He knew that in 1989, after the repairs were completed, all the weep holes were in

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[25] Arcadian operator Thomas Chapman testified that his instructions as a C operator were that if material comes out of a weep hole, they "shut the unit down" because "[t]he weep hole was butted against the stainless steel liner, and what the weep hole was for was to detect a leak in the stainless steel liner which is the carbamate inside the reactor would eat

communication with each other. He knew that urea could solidify in the annulus, and that solidification may make detection of the leak eventually impossible. He personally used condensate during the June leak to free blockage in leak detection tubes, and understood that they used steam during the January leak. Urea Operator David Sittig testified that Bartley told him that "[t]he only thing you have to worry about is if that reactor ever leaks or if it ever blows up. You won't be here to tell about it."

The January and June leaks were warnings to Arcadian's management that a breach had occurred but Arcadian continued to operate the reactor. In 1989, when Olin owned the plant, the same supervisors shut down the plant when a stream of urea came from a leak detection tube because, as Baham acknowledged, it signaled that there was a breach. This evidence establishes a willful state of mind because Arcadian knew that the leaks were warnings that breaches had occurred and could result in a range of extremely hazardous conditions yet deliberately and consciously chose not to address the warnings. *AJP Constr., Inc. v. Secretary of Labor*, 357 F.3d 70, 75 (D.C. Cir. 2004).

The circumstances here are unlike those in *McLaughlin v. Union Oil Co.,* 869 F.2d 1039, 1047 (7th Cir. 1989), *aff'g in pertinent part,* 13 BNA OSHC 1673 (digest), 1987-90 CCH OSHD ¶ 28,155 (digest)(No. 85-111, 1988)(ALJ), where the Seventh Circuit determined that the employer's failure to perform a more thorough inspection of a pressure reactor was negligent rather than willful. The court noted that there had never been either a serious accident of the cited pressure vessel because of hydrogen stress corrosion cracking (the cause of the vessel's rupture), "and while it was careless to suppose that such accidents could not or would not happen, or that the heat-affected zone around a weld was somehow immune from hydrogen stress corrosion cracking, OSHA utterly failed to prove that Union Oil was more than careless." *Id.* However, *Union Oil* did not involve a series of warnings well in advance of the rupture. In that case, there was no warning of the breach, indicated by a vapor cloud originating from a crack in the side of the vessel, until the afternoon the reactor exploded as they attempted to shut it down. 869 F.2d at 1043-44. Here, also, Arcadian had no program to check and keep clear its weep hole warning system. Instead, it consciously

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through the carbon steel liner on the outside of the weep hole."

ignored the warnings and deliberately failed to shut down the reactor. This conscious disregard of Arcadian's duty under section 5(a)(1) of the Act establishes a *prima facie* case of willfulness.

"[W]illfulness will be obviated by a good faith, albeit mistaken, belief that particular conduct is permissible." *Froedtert Memorial Lutheran Hospital, Inc.,* 20 BNA OSHC 1500, 1510, 2003 CCH OSHD ¶ 32,703, p. 51,737 (No. 97-1839, 2004)(citations omitted). Good faith is a question of fact. *A.J. McNulty & Co. v. Sec'y of Labor*, 283 F.3d 328, 338 (D.C. Cir. 2002) The record establishes that Arcadian did not have a good faith basis for its decision not to treat the January and June leaks as warnings and essentially ignore them instead. The record supports the judge's finding that Baham and Bartley were unreasonable in attributing weep hole discharges twice in a six-month period to sources other than leaks from the liner. Indeed, their behavior was reckless. Arcadian has not adduced any evidence to support Baham's theory that the January leak was of material remaining from the previous repair, or that the June leak was material being vented from between two sealed patches. Indeed, for the January leak, if the material had remnants from the previous repair, by all accounts it would have been corroding the carbon steel since 1989. Moreover, we have no explanation why the material would come out after remaining trapped for years. The June leak was fresh material and no action was taken on the first leak for five months. For the June leak, the record contradicts Baham's belief and shows that the filler patch was tack welded and not seal welded. The record also shows that the leak detection tube went to the annulus not through the filler patch. There is no explanation for Baham's misinformation on these facts. While Bartley testified that Arcadian would have shut down the reactor after the June leak if the leak had come out of one of the original weep holes, or if they knew that the patch was actually tack welded, or if they knew that the "leak detection tubes" actually monitored the annulus just like the older weep holes, Respondent's management was factually incorrect regarding two of the three shut-down scenarios. Absent any evidence that Arcadian had a good faith basis for concluding that the leaks were caused by anything other than a breach, its failure to shut down the reactor demonstrates a reckless disregard of employee safety. *See Tampa Shipyard, Inc*., 15 BNA OSHC 1533, 1540, 1991-93 CCH

OSHD ¶ 29617, p. 40,103 (86-360, 1992)(consolidated) (Tampa's practice of attempting crane lifts with the crane's rollers coming off its turntable, indicating a severe overload of the crane, was "reckless" and a willful violation of section 5(a)(1)).[26] Arcadian knew that the purpose of the weep holes was to warn of a breach of the reactor lining and that such a breach, left unchecked, could ultimately result in a catastrophic failure of the reactor. Their decision to treat the weep hole leaks as something other than warnings of a hazardous breach without any reasonable basis in fact and, essentially, ignore them was the equivalent of gambling with employee safety and was, indeed, reckless. *L.E. Myers Co.*, 16 BNA OSHC 1037, 1047, 1993-95 CCH OSHD ¶ 30,016, p.41,134 (No. 90-945, 1993)(violation willful where the crew "gambled" that it could maintain proper clearance without insulating power lines).

IV. Penalty

Section 17(j) of the Act, 29 U.S.C. § 666(j), requires that in assessing penalties, due consideration shall be given to the size of the employer's business, the gravity of the violation, good faith, and the employer's history of violations. Generally, the gravity of a violation is principal factor in penalty assessment. *Trinity Industries, Inc*., 15 BNA OSHC 1481, 1483, 1991-93 CCH OSHD ¶ 29,582, p. 40,033 (No. 88-2691, 1992). Gravity "depends on such matters as the number of employees exposed, the duration of the exposure, the precautions taken against injury, and the likelihood that any injury would result." *J.A. Jones Constr. Co.,* 15 BNA OSHC 2201, 2214, 1991-93 CCH OSHD ¶ 29,964, p.41,033 (No. 87-2059, 1993).

[26] In his decision, the judge observed that Baham and Bartley were "sincere in their belief that they acted responsibly in this case" and that Arcadian's "management, Baham especially, had a genuine concern for the safety of their co-workers." He then went on to find a willful violation. The judge may have been underscoring that an evil or malicious intent is not necessary to establish willfulness. *See, e.g., A.E. Staley Mfg. Co.,* 19 BNA OSHC 1199, 1202, 2000 CCH OSHD ¶ 32,220, p.48,897 (91-0637, 2000)(consolidated), *aff'd*, 295 F.3d 1341 (D.C. Cir. 2002). *See also Ho*, 20 BNA OSHC at 1378, 2003 CCH OSHD at p.51,587 (98-1645, 2003)("an employer can manifest a general good faith but nevertheless be found in willful violation based on the particular circumstances relating to the violation in question"). Regardless of the reason, we do not find that the judge's conclusions are inconsistent with the Commission's finding that Arcadian committed a willful violation of the general duty clause.

The judge assessed the proposed penalty of $50,000. He found that the gravity was high because 87 employees were in danger of serious harm or death. He did not give Arcadian credit for size because it was a large company with over 250 employees. He did not give credit for history because of Arcadian's "significant history of prior OSHA violations," as discussed by OSHA's Deputy Director of the Directorate of Compliance Programs H. Berrien Zettler and OSHA petrochemical safety engineer Mark Briggs. The judge did not give good faith credit because he found that items 1(a) and 1(b) were willful. However, the judge noted that the Secretary reduced the proposed penalty from $70,000 to $50,000 because there were no fatalities, the number of injuries was relatively low, and the employer was developing plans to come into compliance with OSHA's PSM standard.

We find that the record supports the $50,000 penalty assessed by the judge. To support its argument for a lower penalty, Arcadian argues that the likelihood of an accident was low, that they took precautions to prevent damage to the reactor, and, while not disputing that it had over 250 employees, noted that there were about 150 employees at this plant. As discussed previously, however, it appears that the likelihood of an accident from not shutting down the leaking reactor was great and that Arcadian's precautions taken were minimal. While Arcadian claims that 150 employees "cannot be considered large," it does not dispute that a total over 250 employees may be considered large. The Commission has considered employees at other worksites in determining employer size. *See, e.g., Merchant's Masonry, Inc.*, 17 BNA OSHA 1005, 1006-07, 1993-95 CCH OSHD ¶ 30,635, p.42,444 (No. 92-424, 1994).

ORDER

Accordingly, we affirm a willful violation of section 5(a)(1) of the Act and assess a penalty of $50,000.

/s/_____
W. Scott Railton
Chairman

/s/_____
Thomasina V. Rogers
Commissioner

/s/_____
James M. Stephens
Commissioner

Dated: September 30, 2004

SECRETARY OF LABOR, Complainant, v. ARCADIAN CORPORATION, Respondent.	OSHRC DOCKET NO. 93-0628

APPEARANCES:

For the Complainant:
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For the Respondent:
Stephen C. Yohay, Esq., Pamela Reiman, Esq., McDermott, Will and Emery, Washington, D. C.

Of Counsel:
Kessen & Dyer Smith

Before: Administrative Law Judge: Stanley M. Schwartz

DECISION AND ORDER

This proceeding arises under the Occupational Safety and Health Act of 1970 (29 U.S.C. Section 651 *et seq.*; hereafter called the "Act").

Respondent, Arcadian Corporation (Arcadian), at all times relevant to this action maintained a place of business at I-10 West, Lake Charles, Louisiana where it was engaged in the manufacture of agricultural fertilizer. Respondent admits it is an employer engaged in a business affecting commerce and is subject to the requirements of the Act.

On July 28, 1992 a pressure vessel, or R-2 Reactor, involved in the manufacture of urea at Arcadian's Lake Charles work site exploded, injuring six Arcadian employees as well as four employees of other companies in the area and over 90 private citizens. The citations in this matter, alleging violations of the Act together with proposed penalties, were issued on January 27, 1993 as a result of an inspection by the Occupational Safety and Health Administration (OSHA) of Arcadian's Lake Charles work site

following the incident. By filing a timely notice of contest Arcadian brought this proceeding before the Occupational Safety and Health Review Commission (Commission).

Prior to the hearing in this matter, pursuant to Arcadian' motion for summary judgment, the undersigned severed, and vacated items 2 through 87 of citation 2 (*See;* this judge's Orders of February 25, 1994 [*aff'd. & remanded* in *Arcadian Corp.,* 17 BNA OSHC 1345 (No. 93-3270, 1995)], and November 30, 1995).[1] On October 4, 1994 through July 13, 1995, a hearing was held in Lake Charles, Louisiana.[2] A partial settlement agreement, settling all but item 1 of citation 2, was filed by the parties prior to the start of the hearing. That settlement agreement is hereby approved and incorporated herein by reference. Citation 2, item 1 is, therefore, the sole matter remaining at issue in this matter. The parties have submitted briefs and this matter is now ready for disposition.

The Citation

Willful citation 2, item 1 alleges:

Section 5(a)(1) of the Occupational Safety and Health Act of 1970: The employer did not furnish employment and a place of employment to Mary Poullard Smith which was free from recognized hazards that were causing or likely to cause serious physical harm to employees in that there was a catastrophic failure/explosion in a pressure vessel containing liquefied Carbon Dioxide (CO2), Ammonia (NH3), Ammonium Carbamate, and urea, under 2850 psig of pressure at a temperature of 370 degrees Fahrenheit, exposing them to; being crushed/struck by flying/falling debris and/or, asphyxiation/toxic gases. The following conditions contributed to the existence of this hazard:

(a) On or about July 28, 1992, the urea manufacturing operation utilizing a pressure vessel (R-2 Reactor) was not shut down upon previous detection of leaks in the liner of the vessel.

> Feasible abatement methods to correct this condition may include, but are not limited to, shutting the reactor down upon detection of a leak, and identifying the location/cause of the leak by, e.g., radiographic examination of the vessel walls.

(b) On or about July 28, 1992, management had not implemented an adequate program to ensure that the R-2 vessel's leak detection system (weep holes and leak detection holes) was properly monitored for leaks of decomposition gases (CO2 and ammonia) or leaking product (ammonia carbamate).

1. Inconsistent record keeping and review practices were used by employees involved in the inspection of the R-2 vessel's leak detection system.

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[1] This judge's Order severing and vacating items 2 through 87 of citation 2 became a final order of the Commission, and review is now pending in the Fifth Circuit, U. S. Court of Appeals.

[2] The hearing was not closed on the record. Following the close of proceedings on July 13, the parties advised the undersigned by telephone that there would be no surrebuttal; the hearing was, therefore, concluded.

2. Means to thoroughly inspect each element of the leak detection system so as to detect escaping gases, leaking product, or a clogged weep hole/leak detection hole, had not been provided.

Feasible abatement methods to correct this condition may include, but are not limited to, 1) installing manometers on each weep hole/leak detection hole to automatically detect escaping gases; 2) constructing sufficient platforms around the R-2 Reactor to allow direct employee access to all of the weep holes/leak detection holes; 3) implementing appropriate administrative controls to ensure that operators inspect each weep hole/leak detection hole on a periodic basis for conditions indicating a possible leak in the vessel liner, and that operators document the findings of the inspection on a consistent basis using a uniform recording system; 4) drilling/rodding/steaming out clogged weep holes/leak detection holes to ensure that the leak detection system functions according to its design criteria, i.e., that the weep holes/leak detection holes communicate freely to the vessel liner.

(c) On or about July 28, 1992, the Arcadian Corporation operated a pressure vessel (R-2 Reactor) utilizing a stainless steel liner that had been improperly/inadequately repaired, inspected, and maintained.

Feasible abatement methods to correct this condition may include, but are not limited to, complying with appropriate industry codes such as API 510, ASME, Volume VIII, to ensure that critical welds on the pressure vessel are performed according to design specifications, meet industry standards, and are subject to, e.g., non-destructive testing methods prior to the vessel's return to service.

Alleged Violation of §5(a)(1)

Section 5(a)(1) of the Act provides that :

(a) Each employer (1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees; . . .."

In order to prove a violation of section 5(a)(1) of the Act, the Secretary must show that: (1) a condition or activity in the workplace presented a hazard to an employee, (2) the hazard was recognized, (3) the hazard was likely to cause death or serious physical harm, and (4) a feasible means existed to eliminate or materially reduce the hazard. The evidence must show that the employer knew, or with the exercise of reasonable diligence could have known, of the violative conditions. *Tampa Shipyards, Inc.*, 15 BNA OSHC 1533, 1991-93 CCH OSHD ¶29,617 (Nos. 86-360, 86-469, 1992).

Preemption

As a threshold issue, Arcadian argues that 5(a)(1) of the Act is preempted because applicable standards specifically addressing the cited conditions were promulgated under the Process Safety Management Standard at 29 CFR §1920.119(j), implementation of which was stayed by the Secretary until

August 26, 1992. *See*, 57 Fed. Reg. 23060 (June 1, 1992). The stated purpose of the stay of the process safety standard was to allow the Secretary to determine the feasibility of achieving compliance by the effective date of the standard.

The purpose of §5(a)(1) is to provide protection against recognized hazards where no duty under a specific standard exists. *Con Agra, Inc.*, 11 BNA OSHC 1141, 1983 CCH OSHD ¶26,420 (No. 79-1146, 1983). The proposed process safety standards are evidence that process safety hazards are recognized. Clearly Arcadian had no duty to comply with the process safety standard during the stay of those standards. Arcadian's contention that the stay of the process safety standard also abrogated its §5(a)(1) duty to protect its employees from the hazards addressed there, however, would lead to an untenable result. Employees would be deprived of any protection from the group of hazards specifically recognized by those standards during the pendency of the stay.

Moreover, the Secretary's *prima facie* burden in a §5(a)(1) case includes a showing that feasible means to materially eliminate or reduce the hazard, thus obviating the problem addressed by the June 1992 stay.

I find, therefore, that the stay of the proposed process safety standards does not act to preempt §5(a)(1) here.

Definition of The Hazard(s)

Arcadian also argues that the citation, as formulated, improperly denotes the July 28, 1992 catastrophic failure/explosion of Arcadian's R-2 Reactor as the "hazard" against which it failed to protect. Arcadian maintains that the Secretary's refusal to amend the language of the citation is fatal to the Secretary's case because the citation, as worded, alleges that Arcadian actually knew that the R-2 reactor was going to explode and failed to take appropriate action. Arcadian maintains therefore, that the citation thus fails to apprise Arcadian of its obligations, or to identify conditions or practices over which it could reasonably have been expected to exercise control, citing *Pelron Corp.*, 12 BNA OSHC 1833, 1986 CCH OSHD ¶27,605 (No. 82-388, 1986).

The undersigned judge disagrees. The language in the citation is sufficiently broad so as to place Arcadian on notice that it was being cited for failing to take recognized precautions that would have reduced the risk of catastrophic failure/explosion, whether or not those precautions would have prevented the failure/explosion which occurred on July 28, 1992. Those precautions are set out in detail in the citation, as prescribed by the Commission in *Pelron*. In addition Complainant's counsel clarified its position prior to the hearing in opening statements (Tr. 40-72). The mere fact that the citation here is

couched in terms of the specific incident which brought about the OSHA inspection and citation did not deprive Arcadian of notice, either of the issues against which it was required to defend, or of the conduct expected of it by OSHA.

Finally, it has long been the position of the Commission that in a general duty clause case it is the hazardous condition, not the specific incident that resulted in injury, that is relevant in determining the existence of a recognized hazard. *Waste Management of Palm Beach*, 17 BNA OSHC 1308, 1309 (No. 93-128, 1995), *citing, Kelly Springfield Tire Co.*, 10 BNA OSHC 1970, 1982 CCH OSHD ¶26,223 (No. 78-4555, 1982).

In light of the long line of Commission cases dealing with the way a 5(a)(1) hazard is defined, as well as Complainant's own description of its case, it would have been unreasonable for Arcadian to rely on its narrow reading of the citation. The fact that Arcadian fully tried the relevant issues subject to a continuing objection demonstrates that it was able to identify and address the hazards named by the Secretary. The hazards postulated by the Secretary, and which will be addressed here are:

(a) Arcadian's failure to shut down its urea manufacturing operation (R-2 Reactor) upon its detection of leaks in the pressure vessel;

(b) Arcadian's failure to implement an adequate monitoring system for the detection of leaks;

(c) Arcadian's failure to conduct adequate inspection, maintenance and repairs;

all of which conditions/practices exposed Arcadian's employees is the potential catastrophic failure of its pressure vessel (R-2 Reactor)[3].

Citation 1(a)

ISSUES

Arcadian does not seriously dispute the necessity of shutting down a pressure vessel such as its R-2 reactor upon the detection of leaks. Arcadian maintains, however, that it did not know, nor with the exercise of reasonable diligence could it have known, that its R-2 reactor was leaking prior to the July 28, 1992 explosion, or that the failure of the R-2 vessel would pose a serious hazard to its employees. Arcadian also argues that the Secretary failed to prove that shutting down the reactor would have eliminated or materially reduced the cited hazard.

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[3] While *Pelron, supra* appears to prohibit designating a "potential" condition as a recognized hazard under 5(a)(1), such a designation is not fatal where the citation identifies specific practices over which the employer can reasonably be expected to exercise control, and which will mitigate "possible hazards and potential danger." *Nelson Tree Services Inc. v. OSHRC*, 60 F.3d 1207 (6th Cir. 1995).

FACTS

The R-2 Reactor. The R-2 vessel which is the subject of this action was a stainless steel lined multilayered pressure vessel approximately 90 feet tall and 6 feet in diameter with a capacity of 1836 cubic feet. The reactor consisted of an outer shell composed of 14 layers of carbon steel and a stainless steel liner. The carbon steel shell was constructed of four shell sections, each 19' 9-3/4" wide, welded together between a top and bottom head. The stainless steel liner was attached only at the top and bottom heads and was ½" thick. In the vessel, carbon dioxide, ammonia and water were combined under pressure to produce urea, a fertilizer. As designed and operated the vessel maintained an interior pressure of approximately 2750 to 2865 psig at 340-375° Fahrenheit (Tr. 119, 143, 197-99; Exh. G-83, pp. I-4, I-5, G-125, pp. 3-4).

Mahesh Madhani, a metallurgic failure investigator (Tr. 2800-20, 2693-94) has been involved in 1000 failure investigations, including investigations involving the analysis of corrosion in austenitic (corrosive resistant) steel (Tr. 2810). Madhani testified, without contradiction, that the July 1992 explosion of the R-2 vessel resulted from the failure of the clip weld-joint and liner above the C-7 circumferential weld[4] in the northeast quadrant. Carbamate penetrated through the liner, corroding seven layers of carbon steel plates until the remaining six wraps could not withstand the service pressure and failed (Tr. 2729, 2846-48; Exh. G-263, p. 12). *Accord*, testimony of Richard B. Setterlund, with Metallurgical Consultants, Inc., who was hired by Arcadian to conduct an investigation into the cause of the R-2 reactor failure (Tr. 2345; Exh. G-125, p. 104).

Failure to Shut Down Reactor Upon Detection of Leaks

Hazard Recognition. It is uncontested that the purpose of the corrosion-resistant stainless steel liner in the R-2 reactor was to protect the carbon steel shell from contact with carbamate, a highly corrosive substance which is a by-product of the urea production process (Tr. 1869-71, Larry Schell, urea superintendent with Olin Corporation[5], Exh. G-104, p.2). Arcadian was well aware that if leakage occurred in the corrosion-resistant lining, the corrosive carbamate would contact the carbon steel and rapidly corrode the vessel's outer shell (Tr. 2204, Arcadian's urea area supervisor, Richard Bartley). It is uncontested that

[4] The welds between the sections of the outer shell were numbered C-1, C-3, C-5, C-7 and C-9, from bottom to top.

[5] Arcadian acquired the urea and ammonia units at Lake Charles from Olin Corporation in 1989, along with much of the personnel involved in the operation of those units (R.B., p. 72).

upon detection of a leak in the lining, the vessel should be shut down (Tr. 2307-08, Bartley; 9215-16, Arcadian's urea unit superintendent, Dana Baham). On June 23, 1989 Dana Baham, who was then employed by Olin Corporation, ordered the R-2 reactor shut down within an hour of being informed that the reactor had developed a leak (Tr. 491, 660-61, 9205-11).

Dr. Richard LeVine was the fire protection manager responsible for chemical loss prevention and fire protection engineering at Olin Corporation between 1956 and 1986 (Tr. 3900). In 1964 and 1965 LeVine performed a hazard evaluation of the urea operation (Tr. 3907-09). LeVine, a chemical engineer, and president of Chemical Hazard Evaluation Consultants Inc. (Tr. 3893-94), testified that the necessity of shutting down a pressure vessel such as the R-2 reactor upon the detection of a leak was recognized by him and other safety professionals in the industry at the time he worked for Olin (Tr. 3909, 3915-16, 3939-41). LeVine pointed to industry publications such as Complainant's Exh. 184, "Repairing Titanium-Lined Urea Reactors," by Clark and Dunmore, in *Ammonia Plant Safety*, 1975, Vol. 18, p. 99, which states:

> It is well known that if a liner leaks, whether it is silver, austenitic steel, titanium, or any other metal, corrosion of the base steel by the urea melt can be very rapid. Standard practice with vessels having loose liners is to have a number of weep holes through the pressure shell so that liner leaks can be detected. To avoid damage, a reactor should be brought off line within a day after a leak starts.
> . . . No time should be spent in arguing whether it is a false alarm; the reactor should be brought off line immediately.

Knowledge of a Hazardous Condition

Arcadian's Leak Detection System. In order to detect leaks in the R-2 vessel's liner, 24 tubes accessing the annulus[6] between the liner and the carbon steel shell, or "weep holes," were installed 120° apart above and below each of the circumferential welds (Tr. 276-278, 2151, 2355, 2514-16, 2355; Exh. G-125, p. 47, G-240, G-241). During repairs made in 1989, stainless steel filler patches were welded flush into the R-2 reactor's liner in the area of the C-5 and C-7 circumferential welds where portions of the original liner had been cut away; an overlay patch was full seal welded over the filler patches on the inside of the liner wall (Tr. 1297-99; Exh. G-49). Two additional weep holes, also referred to as leak detection tubes, were added to the reactor's outer shell in the area of the C-5 weld to monitor the repair patch; a third leak detection tube was added at a similar repair in the C-7 weld area (Tr. 2152-53). Setterlund examined the leak detection tube at the C-7 weld, and testified that the only differences between the original weep

[6] Webster's II New Riverside University Dictionary defines *annulus* as: the figure bounded by and containing the area between two concentric circles. Here, the term is used exclusively to refer to the void between the shell and liner.

holes and the 1989 leak detection tubes were the material the tubes were made of (stainless in 1989 vs. low alloy steel in the original construction), and the way the tubes were welded into the outer shell (Tr. 2358-60, 2376). Both the weep holes and the leak detection holes monitored the annulus between the outer shell and the liner (Tr. 2445).

Under normal conditions, material coming out of the weep holes indicates that carbamate has gotten through the liner (Tr. 1871; Exh. G-104).

The January 1992 Event. At or about 1:00 a.m. on January 3, 1992, R-2 operators, Dick Richardson, David Baham, and Bill Brunkhardt noted a small brown blob of urea hanging from a weep hole in the area of the C-7 weld (Tr. 361-64, 962-63). Dana Baham was notified at home; Baham testified that he left instructions for the operators to check the other weep holes at that time (Tr. 9829). Richardson and David Baham testified that upon examination of the other weep holes in the area, they found material in a weep hole to the northwest, as well as in the weep hole where the extrusion was found (Tr. 363-64, 963). Dana Baham was informed, and he instructed the operators to go up and steam out the weep holes (Tr. 366, 9830). Richardson steamed out the C-7 weep hole, but did not recall steaming the one to the northwest; David Baham testified that they attempted to clean that hole out as well, but had trouble reaching it (Tr. 376-78, 1029-39, 4111-12). The operators nonetheless informed Dana Baham that the holes were clear (Tr. 378, 963-64, 9837). Baham told the operators to continue monitoring the weep holes for further emissions, and to call if anything abnormal happened (Tr. 378-79, 9847).

Baham recognized that the extrusion of urea from a weep hole indicated a possible hole in the reactors liner (Tr. 9846; Exh. G-28, Operator's log for January 3, 1992, p.4). Baham concluded, however, that if there had been a leak in the vessel's liner a stream of urea, ammonia and CO_2 would have come out of the weep hole, as it did in June of 1989, prior to the 1989 shut down and repair of the reactor (Tr. 9838-39). Based on the fact that no further material came from the weep hole after it was steamed (Tr. 7087), Baham decided that the extruded urea had not come from a leak in the reactor liner, but had been trapped, undetected, in the annulus during the 1989 leak, and that during various shut downs and start ups had been squeezed between the liner and the vessel's outer shell, traveling radially and vertically within the annulus until, following the latest shut down on December 31, 1991, the hardened urea was expelled through the weep hole (Tr. 9839-44).

The subsequent accident investigation revealed that a long standing leak at the C-7 weld was responsible for the failure of the R-2 reactor (Tr. 11268-69)

The Secretary's Experts. James Foster, a management consultant to the nitrogenous fertilizer industry, has 25 years of experience in the management of nitrogen fertilizer facilities (Tr. 3253-3305; Exh. G-131). Foster testified that Dana Baham's conclusions with regards to the January 1992 urea extrusion were unreasonable. Foster opined that, though possible, it was highly improbable that material trapped at the C-5 level in 1989 would be forced upwards 17 to 18 feet, to be extruded 2-1/2 years after the fact (Tr. 3326-27). Foster noted that the annulus of the R-2 reactor had been flushed and found clear following the 1989 repairs prior to being put back into service (Tr. 3326; Exh. G-131). Kevin LeDoux, an Olin engineer involved in the 1989 repairs, testified that he kept a daytime log of the progress on the repairs for Dana Baham (Tr. 1476-77). LeDoux stated that when the liner was ground out for patching in 1989 the annulus was checked, both visually and with compressed air, to assure that there was no product remaining in the space between the liner and the outer shell; no product was found (Tr. 1632). LeDoux testified that Baham was made aware of their findings (1632-34).

Terence Lynch, a consultant with Fertilizer Technology Group, has been in the fertilizer industry since 1965 (Tr. 4144, 4155-67). From that time until 1990 Lynch worked as a works chemist, technical superintendent, and research and technical manager at CIL, an ammonia and urea manufacturing facility (Tr. 4156-67, 4219-21). Lynch stated in his report on the urea reactor failure that old urea left behind the liner would decompose into cyanuric acid, ammelide ammeline, and possibly melamine; all of which chemicals are extremely hard and have a melting or decomposition temperature above the working temperature of the R-2 reactor (Exh. G-132, p. 16). Lynch opined that recently leaked urea and ammonia carbamate would be soft and more likely to extrude (Exh. G-132, p. 16). Lynch testified that a urea extrusion indicates the possibility of a leak, and that the accepted procedure is to shut down (Tr. 4404).

The June 1992 Event. On June 14, 1992 Charles Chapman, Mickey Sullivan and Mary Poullard Smith, the R-2 operators on duty, discovered a leak from a weep hole in the area of the C-5 weld (Tr. 495, 576-80). Mary Poullard Smith described the leak as a flow of white liquid, "fizzling" as it came out of the weep hole (Tr. 583). Poullard and Sullivan stated that they called Dana Baham at home to inform him of the leak (Tr. 496). Poullard testified that Baham left no instructions for the operators telling her that he would look at the leak when he came in the next day (Tr. 496, 584-85).

Baham testified that he had no distinct memory of his reaction to the leak until the next morning when he arrived at the office the following day and began reviewing drawings of the reactor to ascertain the location of the leak (Tr. 9974). Baham determined that the leak was located in the area of one of the 1989 repairs (Tr. 9878). Richard Bartley then appeared at Baham's office, having learned of the leak.

Bartley testified that he first assumed that one of the 1989 welds had failed (Tr. 2266-67). Together he and Baham reviewed Baham's journal documenting the 1989 repairs (2260-61). Baham and Bartley came to the conclusion that the material leaking from the weep hole was not in contact with the carbon steel shell and that it was not necessary to shut down the R-2 Reactor (Tr. 2262, 9876, 9879-83). The leaking weep hole was one that had been installed in 1989, and Baham and Bartley believed that it was not in communication with the annulus, but solely with the space between the filler patch and overlay patch. Baham believed that only the overlay patch was leaking, and that because both patches were full seal welded the leaking product was entering the space between the seals and being shunted directly to the outside through the weep hole tube without contacting the carbon steel shell (Tr. 2264, 9881, 9891; Exh. R-169). Bartley testified that if the leak had been coming from any of the weep holes other than the two added in 1989, the reactor would have been shut down (Tr. 2263-64).

Baham testified that his conclusions were supported by the absence of any reddish discoloration in the discharge, which would have indicated corrosion of the carbon steel (Tr. 9899-9901, 10187). In addition, Bartley testified that when he used a steam lance to flush out the leaking weep hole, the steam came out the other weep hole in the C-5 patch (Tr. 2256-57). Baham believed that the communication of the two weep holes added in 1989 proved that the space between the two patches was closed off (Tr. 9911-9913, 10217-18).

Based on Baham's and Bartley's conclusions, the R-2 operators were instructed to bring the reactor back up to production rates, and to monitor the leak, which continued until the July 28 explosion, for color changes (Tr. 347, 2295, 2301, 7111-12, 9910-13; Exh. G-28, June 22, 1992). No other plant personnel, including the plant manager, Ernie Elsbury, and the head of reliability and maintenance engineering, Ed Anderson, conducted an independent investigation of the leak, relying on Baham's evaluation of the situation (Tr. 2623-28, 7784-87).

The record does not reflect what Baham and Bartley saw in Baham's journal which led them to believe the weep hole tube was welded through both the carbon steel shell and the filler patch, or that the filler patch was full seam welded, closing off the space between the two patches (Tr. 2280-81, 2290). The journal was rendered unreadable as a result of the July 28th explosion (Exh. G-56; Respondent's post-hearing brief, fn.159). Loose in Baham's journal, however, was the repair proposal from Schoeller-Bleckmann, the maintenance contractor performing the 1989 repairs (Exh. G-57). The proposal states that the filler patches were to be tack welded, which would allow the passage of material between the annulus and the space between the patch (Tr. 2264, Exh. G-57, p. 15-16).

The final report from Schoeller-Bleckmann, containing repair specifications, was also in Bartley's files on the R-2 reactor, and was available to Arcadian (Tr. 2109, 2119; Exh. G-60). The report was not consulted between the time the leak was discovered and the July 28 explosion (Tr. 2289, 8417). As in the proposal, the specifications call for tack welds around the filler patch (Tr. 2291-93; Exh. G-60, p. 33, 37). A photograph of the completed C-7 weld, contained in the report, shows the tack welding around the filler patch (Tr. 2895, 2912; Exh. 256, 293).

The specifications call for, and photographs of the C-7 filler patch show a hole drilled into the patch as part of the leak detection system (Exh. R-162, G-60, p. 33). Setterlund testified that all the patches had holes (Tr. 2505). Nothing in the specifications calls for the leak detection tubes to be welded into the holes in the filler patches, however, and Setterlund testified that the leak detection tube at C-7 was not welded to the insert patch, but terminated just short of the hole drilled in the patch (Tr. 2404, 2445, 2499, 2897). Baham admitted that he did not see tubes pushed through the holes at the C-5 weld, or see the tubes welded to the flush patches (Tr. 10063; Exh. G-60).

Foster agreed that the clear or whitish color of the fluid leaking from the weep hole indicates no corrosion was taking place in the space between the two patches at the C-5 weld; however, he stated that if urea was escaping through the tack welding on the C-5 patch it would not have been shunted out through that weep hole and would have corroded the carbon steel shell without affecting the color of the discharge at the C-5 weep hole (Tr. 3425-34; *See*, testimony of M. Madhani, pp. 3153-54, Exh. G-275 pp. 135, G-276 pp 1066).

Finally, and as noted above, when a weep hole check was performed at the completion of the 1989 repairs, all weep holes, including the newly added holes, were found to be in communication with each other (Tr. 1462-64). LeDoux testified that Bartley was present during the weep hole testing, and Baham was informed of the results of the test (Tr. 1465; *See*, testimony of Bartley in accord (Tr. 2160-64).

Potential for Catastrophic Failure of the Pressure Vessel

Arcadian maintains that it reasonably believed that its R-2 reactor was designed so that it could not fail, or, alternatively, that its industry did not recognize that the failure of a pressure vessel such as its urea reactor presented a hazard which was likely to cause serious harm to employees. Complainant maintains that both the nitrogenous fertilizer industry and Arcadian itself recognized the potential for catastrophic failure/explosion in any multi-layer pressure vessel in urea service.

The Evidence. Ernie Elsbury, Arcadian's plant manager, testified that prior to the July 28, 1992 explosion, he was unaware of any urea reactor ruptures (Tr. 7044-45) Elsbury stated that he believed the

R-2 reactor was so designed that failure could be averted with early detection of problems; in the event of vessel failure, long and costly repairs would be the only result (Tr. 7041, 7089-90, 7507-08). Dana Baham also testified that he had never heard of any incidents involving the rupture of a urea reactor prior to July 28, 1992 (Tr. 9203-04).

In support of Elsbury and Baham's testimony, Respondent introduced brochures from the manufacturer of the R-2 vessel, Chicago Bridge and Iron (CB&I), which state:

> . . .[M]ultiple layers not only resist initiation of failures, but also serve to prevent propagation into adjacent layers. Should a fracture occur in any layer, the load is shifted to the other layers without compounding or magnifying the force.. . .Since the operating pressure is well below the bursting pressure, the possibility of catastrophic failure is almost inconceivable. (Exh. R-18).
>
> The inner shell is pressure tight. The load bearing layers are vented to the outside. If a leak should develop in the inner shell through exposure to corrosive elements or other operating conditions beyond the designed capability, the fluid would be safely vented for immediate detection and corrective action--before a serious failure could occur. (Exh. R-171).

Dr. Richard LeVine testified that prior to the 1992 explosion, ruptures of multi-layered pressure vessels had been discussed in at least three seminars of the American Institute of Chemical Engineers (A.I.Ch.E.), which were attended by engineers and operators of ammonia plants and related facilities, including urea plants (Tr. 3923-25, 3932, 3943; Exh. G-130). Dr. LeVine stated that he and others in the field recognized the rupture hazard based on the available literature, including: "Materials and Corrosion Problems in Urea Plants" by P.E.Krystow, in *Ammonia Plant Safety*,1971, Vol. 13 ["If excessive carbamate melt should leak out of the wrapped vessel reactor due to failure of the inner titanium[7] layer, serious corrosion and possible rupture of the vessel can occur."] (Tr. 3934; Exh. G-183, p. 97); "Urea Reactor Failure" by Jojima, in *Ammonia Plant Safety*, 1979, Vol. 21 [discussing the 1977 explosion of a urea reactor in Columbia](Tr. 3941-43; Exh. G-188).

Arcadian admits it is a member of the Ammonia Symposium and Annual Safety Meetings by AIChE and maintains copies of *Ammonia Plant Safety* on file (Exh. G-181, G-182).

Terence Lynch testified that, as was customary for urea manufacturers, he attended meetings of the ANPSG [Ammonium Nitrate Pollution Study Group]; a representative from Arcadian, Ahmad Hujaber has attended for approximately 10 years (Tr. 4179-81). As a member of the industry, Lynch also attended ammonia safety symposium sponsored by the AIChE and received their publications (Tr. 4224-29). Lynch

[7] LeVine stated that the metallurgical make-up of the liner was irrelevant. The end result of the liner's failure, whether titanium or stainless steel, would be identical, i.e. corrosion of the carbon steel shell (Tr. 3935; *See also*, testimony of Terence Lynch, in accord, Tr. 4202).

testified that Jojima's paper "Urea Reactor Failure" which details the 1977 failure of a urea reactor in Columbia, and which was presented at the 1978 AIChE symposium (Exh. G-189) was also presented at the ANSPG during that time period (Tr. 4230, 4269). Lynch understood that in the Columbian incident the reactor's outer shell corroded until it wouldn't support the vessel pressure and exploded. Thirty-three people were killed by the ammonia fumes released (Tr. 4271).

At an ANPSG meeting in 1978 Lynch also became aware of an incident involving a multi-layered urea reactor operated by CF Industries, in which a leak developed in the liner, corroding the shell. When the shell could no longer sustain the interior pressure, the contents of the reactor were "ejected," through the head of the reactor (Tr. 4260-4264; Exh. G-186).

Lynch testified that the publications of Trevor Kletz on process safety are considered authoritative in the urea industry (Tr. 4284-86). Kletz, in *What Went Wrong; Case Histories of Process Plant Disasters*, Second Edition, relates the failure of a multi-wall vessel in an ammonia plant. The vessel disintegrated 10 days after developing a gas leak, causing extensive damage.

> The report on the incident states: "Our reading of the literature led us to believe that as long as the leaking gas could be relieved through the weep holes, it would be safe to operate the equipment. . . . Consensus at the time supported our conclusion. But after the explosion, there was some dispute over exactly what was said and what was meant. Knowing what we know now, there can be no other course in the future than to shut down operations in the event of a leak from a weep hole under similar circumstances. (Exh. 187, p. 133).

Lynch testified that even if ignorant of prior reported incidents, the operator of a urea reactor should recognize the inherent hazards associated with any pressure vessel. If the pressure containing outer shell becomes corroded from a leak in the inner liner, it may no longer be able to contain its pressurized contents, and a sudden release of energy and of the contents of the vessel may result (Tr. 4325-4332).

The testimony of Dr. Chester Greleki, a chemist and president of Hazards Research Corporation (Tr. 4934, 4940-43), agrees with that of Lynch. Greleki testified, based on his experience evaluating between 15 to 20 accidents involving high pressure vessels (Tr. 4977), that members of the urea industry do, or should, recognize the explosive potential of a multi layer urea reactor solely on the basis of the physics and chemistry involved (Tr. 5076; Exh. G-133, p.2).

Arcadian's reliability and engineering manager, Ed Anderson, was employed by CF Industries between 1973 and 1984 as a process project engineer, manager of engineering and plant manager (Tr. 2559, 2573). Anderson was familiar with the 1976 urea reactor failure at CF Industries (Tr. 2568, 2642). Anderson testified that ammonia carbamate was released due to the failure, and that the reactor had to be

scrapped afterwards (Tr. 2661-63). Anderson was aware, prior to the July 28, 1992 explosion, of two other urea reactor failures, in South Africa, and Columbia, but stated that he was not familiar with the details (Tr. 2664-69). Anderson admitted, however, that catastrophic failure of a multilayered pressure vessel was a possibility (Tr. 2669).

Richard Bartley testified that he had heard about the rupture of a urea reactor in South America, but maintained that he did not know people were killed (Tr. 2306-07). Bartley admitted, however, that he was aware that a pressure release from the R-2 reactor could cause damage to equipment and personnel (Tr. 2314-15). Bartley also was aware that anhydrous ammonia, contained within the urea reactor, is an inhalation hazard, can cause chemical burns, and in sufficient quantities, death (Tr. 2308-10).

ANALYSIS

Recognition that the Hazard was Likely to Cause Harm

In this case it is undisputed that both the industry and Arcadian itself recognized the need to shut down a multi-layer pressure vessel once a leak is detected in its liner in order to protect the outer shell from corrosion. Arcadian argues only that the Secretary failed to prove it or its industry recognized that failure to shut down a leaking reactor would could result in *catastrophic* failure, or harm to employees. Arcadian maintains that its management reasonably believed, based on the assurances of the manufacturer, that the multi-lined R-2 vessel could not fail catastrophically. Arcadian further argues that Complainant's witnesses were unqualified to render an opinion on industry recognition, and that their testimony, as well as the literature they relied upon in forming those opinions, should be discounted.

The C B & I Brochures. The record does not support Arcadian's contention that it reasonably believed its R-2 vessel could not fail. Even when read in the light most favorable to Arcadian, the brochures from C B & I do not claim that its vessels cannot fail; Respondent's Exh. R-18 states only that such vessels do not fail under expected operating conditions. The passage referred to by Arcadian in Exh. R-171 indicates, nonetheless, that "serious failure" of a vessel could occur if corrosion is not detected, and corrective action taken. Arcadian should have known, based on the C B & I brochures, that the safety of such vessels is not absolute, but is dependent on retaining the integrity of the outer shell. Plant Manager Elsbury's testimony establishes that this was, in fact, his understanding.

Industry Literature. Arcadian contends that the articles introduced to show industry recognition of a potential for catastrophic failure, including Exhs. G-183, G-184, G-186, G-187, and G-188 are hearsay, and were erroneously admitted into evidence. Arcadian contends that the articles do not meet the

criteria for "learned treatises" and therefore should not have been admitted pursuant to the exception provided in Rule 803(18)[8].

Arcadian's contention is unpersuasive merit as the articles are relied upon by Complainant to establish industry recognition of, rather than the truth of, the statements contained therein. Industry recognition is an operative legal fact with independent legal significance. Operative legal facts may be established without the underlying facts being true. 2 S. SALTZBURG, M. MARTIN, FEDERAL RULES OF EVIDENCE MANUAL at 139 (5th Ed. 1990). The articles were not submitted for a hearsay purpose, and therefore are not hearsay. As non-hearsay, they need not come within an exception to the hearsay rule and were properly admitted. Alternatively, they are also admissible under Rule 803(18) if considered hearsay, as "learned treatises".

Complainant's Witnesses. Arcadian argues that the testimony of Complainant's witnesses should be discounted because none, with the exception of Lynch had experience in the urea manufacturing industry. Arcadian objects to Lynch's testimony on the grounds that his experience was with reactors and processes different than that used by Arcadian. Arcadian maintains that these witnesses offered testimony on matters far beyond their expertise, which was improperly admitted.

The undersigned finds that Drs. LeVine and Grelecki, though not experts in urea manufacturing, are, by means of their education, training and experience, qualified safety experts familiar with pressure vessels, and are qualified to offer opinion testimony as to the fire and explosion hazards known to be associated with such vessels.

Both Foster and Lynch's extensive experience in the fertilizer industry amply qualify them to testify to the industry's recognition of those hazards.

The described testimony was properly admitted pursuant to Rule 702[9].

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[8] **Rule 803. Hearsay Exceptions; Availability of Declarant Immaterial.** The following are not excluded by the hearsay rule, even though the declarant is available as a witness: (18)Learned treatises. To the extent called to the attention of an expert witness upon cross examination or relied upon by him in direct examination, statements contained in published treatises. . . established as a reliable authority by the testimony or admission of the witness and by other expert testimony or by judicial notice. If admitted, the statements may be read into evidence but may not be received as exhibits.

[9] Arcadian's contention that the Secretary's evidence is inadmissible under *Daubert v. Merrell Dow Pharmaceutical, Inc.*, 113 SCt. 2786, 125 L.Ed.2d 469 (1993) is without merit. *Daubert* discusses the criteria for determining the validity of novel scientific evidence prior to its admittance for consideration by a jury. First, *Daubert* has never been applied in Commission proceedings where trial is to an administrative law judge. Moreover, application of the *Daubert* test as suggested by Arcadian would limit expert testimony on hazard recognition to hazards which are empirically provable, thus altering the Secretary's burden, established by Congress, to show industry recognition regardless of whether such hazards have been subjected to the scientific method.

Conclusions. The testimony and industry literature amply demonstrate that the nitrogenous fertilizer industry recognized the hazard described in citation 1(a), failure to shut down a multilayered pressure vessel upon detection of a leak in the liner of the vessel. The undersigned is convinced that neither the differences in multi-layer pressure vessels nor the specific chemical processes involved in the production of urea affect either the explosion or toxic chemical hazards associated with those vessels. Failure to abate such hazard was known to increase the likelihood of corrosion and failure of the vessel's pressure bearing outer shell. The record demonstrates that corrosion in a pressure vessel's shell presents a hazard likely to cause death or serious physical harm, either from the explosive rupture of the vessel or from its release of toxic gases. Furthermore, the evidence establishes that publications from the manufacturer put Arcadian on notice of the danger of vessel failure due to undetected corrosion, and that members of Arcadian's management, Ed Anderson and Richard Bartley were actually aware of the possibility that the contents of the R-2 vessel could be released in the event of a reactor failure, exposing employees to toxic gases.

The Secretary has established that Arcadian had both constructive and actual knowledge that the cited hazard was likely to cause death or serious harm.

Knowledge of the Existence of the Hazardous Condition

The extrusion of urea from the C-7 weep hole in January 1992, as well as the steady stream of product from the C-5 weep hole in June 1992, provided Arcadian with ample evidence that the liner of its R-2 reactor was leaking in one or more places. It is found that Baham's and Bartley's attribution, twice in a six month period, of weep hole discharges to sources other than leaks was unreasonable. Leak detection was the sole function of the weep holes. In the absence of clear evidence to the contrary, Baham and Bartley should have assumed, that discharges from the weep holes did, in fact, indicate one or more leaks. Arcadian could not produce the portion of Baham's records relied upon by Baham and Bartley, nor could those individuals adequately explain what in those records made them believe that the weep holes at the C-5 weld were different than the other weep holes, monitoring the space between the two repair patches at C-5 rather than the annulus. Additional written records, which were readily available to them, and which contradicted their theory were never consulted.

It was further unreasonable for Arcadian to rely on the absence of discharge from other weep holes without ascertaining that those weep holes were open, as discussed at length in the following section on citation 1(b).

Finally, it was unreasonable for Baham to rely on the absence of corrosion byproducts in urea stream. Under other possible scenarios, a clear urea stream could be flowing from the tube while, as noted by Foster, additional leaking urea might remain inside the shell, corroding the carbon steel. The test of good faith for these purposes is an objective one -- whether the employer's belief concerning a factual matter, or concerning the interpretation of a standard, was reasonable under the circumstances. *Calang Corp.*, 14 BNA OSHC 1789, 1987-90 CCH OSHD ¶29,080 (No. 85-319, 1990). Baham's failure to consider other possible scenarios militates against any finding that the theory enunciated at trial was held in good faith.

Feasibility of Proposed Abatement Measures

Arcadian argues that Complainant failed to prove that the suggested means of abatement were feasible, because it was not shown that shutting down the reactor would have eliminated or materially reduced the cited hazard. Arcadian argues that shutting down the reactor and conducting an examination of the weld in the C-5 area would not have revealed the corrosion at the C-7 level, which caused the R-2 reactor failure. Arcadian maintains that such examination, therefore, would not have provided any useful abatement of the hazard.

The undersigned has already ruled that the Secretary need not establish the cause of the July 28 explosion in order to establish his case (Tr. 11202-03). Likewise Complainant need not show that Arcadian's employment of the suggested abatement measures would have prevented the July 28 accident. *See; Waste Management of Palm Beach, supra.* [Specific incident that resulted in injury not relevant to hazard determination].[10] In determining feasibility, the question is whether such precautions are recognized by "knowledgeable persons familiar with the industry as necessary and valuable steps for a sound safety program in the particular circumstances existing at the employer's worksite." *Cerro Metal Products Division, Marmon Group, Inc.*, 12 BNA OSHC 1821, ¶27,579 (No. 78-5159, 1986).

The record establishes that knowledgeable persons in the industry would have shut down a urea reactor in the circumstances described during these proceedings until the source of the leak was identified. The violation at citation 1(a) has been established.

Citation 1(b)

[10] It is noted, however, that had the R-2 reactor been shut down and inspected, the absence of corrosion at the C-5 overlay patch would have disproved Baham's theory that the urea was coming from a leak in the overlay patch and alerted Arcadian to the existence of some other source.

ISSUES

Citation 1(b) charges Arcadian with: [1] failing to keep consistent records documenting the results of its leak detection monitoring; and [2] with failing to adequately inspect its weep hole system for evidence of escaping gas and/or leaking product, and to assure that the weep holes remained open and in communication with each other.

The citation lists four methods of abatement: 1) installing manometers to automatically detect escaping gases; 2) constructing platforms to allow employee access to all of the weep holes; 3) implementing appropriate administrative controls and a uniform recording system to operator inspections of the weep holes; 4) ensuring that the leak detection system functions according to its design criteria, i.e., communicates freely to the vessel liner.

Arcadian maintains that Complainant failed to prove that the nitrogenous fertilizer industry recognized a hazard associated with Arcadian's method of monitoring the weep hole system, or that the R-2 reactor's weep holes were clogged at the time of the July 1992 explosion.

FACTS

Monitoring of Weep Holes/Record keeping Practices. Weep holes were visually monitored for leaking product by the R-2 reactor C operators as part of their hourly inspections of the reactor (Tr. 145, 326, 536-37, 1197, 1012). If the C operator did not observe any discharge or emission from a weep hole on his rounds, he was to check or otherwise mark the "R-2 weep holes clear" column of the operator's #3 Reading Sheet, which was located in the control room (Exh. 2216; Exh. G-29). Where an emission or discharge was noted, the operator was to leave the column blank (Tr. 2216). If the operator was too busy to check the weep holes, he or she might write "too busy" or "busy" in that column. (Tr. 2216). Sometimes the operators used a dash mark instead of a check, or instead of leaving the column blank (Tr. 2217; Exh. G-29)

Inspection of Weep Hole System. The weep hole leak detection system on Arcadian's R-2 reactor was checked for proper functioning, *i.e.* communication between weep holes, following completion of the 1989 repairs (Tr. 2208-09). Richard Bartley testified that was the only time such tests were performed (Tr. 2164, 2209). Bartley and Baham did not ensure the communication of the weep holes during their inspection of the reactor in February of 1991 (Tr. 2218, 8328). Nor was the communication of the system checked following Baham's January 1992 determination that residual material from the 1989 repairs had been trapped between the liner and the carbon steel shell (Tr. 2252).

Weep holes on the northeast side of the reactor were accessible from the platform and stairs on the reactor (Tr. 369, 839). The eight weep holes on the south, or back side were not accessible, but were monitored from the ground (Tr. 354, 367-70, 839). On the south, operators could see the weep hole openings, but could not see down the tube (Tr. 1077-78, 2215). Bartley testified that operators could get to within two feet of the closest weep holes, six to eight feet of those further away (Tr. 2214). Bartley admitted that it is impossible to tell from a visual check alone whether the 1/4" weep holes are clear (Tr. 2214).

During the accident investigation Setterlund, Arcadian's metallurgist, found that the northeast weep holes above and below the C-7 weld were plugged, as was the northwest weep hole below the C-7 weld and the leak detection tube installed at the C-7 weld in 1989 (Tr. 2378-79; Exh. G-125, p. 99)

Recognition of a Hazard/Monitoring & Record keeping. Stamicarbon recommends that leaks be detected early, at the non-corrosive gaseous stage (Exh. G-104, p.2, G-108, G-112). Terence Lynch testified that the most common continuous monitoring system (also recommended by Stamicarbon), consist of tubes run, either collectively or individually, from weep holes to either a chemical indicator or to a vat of oil (Tr. 4448; Exh. G-104, G-108, G-112). The chemical indicators would change color if ammonia was detected, bubbles would form in the oil if gas was present (Tr. 4448). Lynch testified that he had recommended the installation of an electronic device which, when placed in each weep hole, continuously measured the conductance of the space and emitted a signal picked up by an instrument in the control room (Tr. 4444). If conductance increased somewhere in the reactor, an alarm would sound, alerting the operator to visually locate the problem (Tr. 4445). Lynch testified that in his opinion, continuous monitoring is superior to visual monitoring, in that gaseous leaks could be detected in the early stages (Tr. 4439).

Lynch, however, was also familiar with facilities where visual inspections were used, and testified that the continuous monitoring system he described was no longer in use, but had been discontinued against his recommendation (Tr. 4441, 4446).

Foster testified that he believed the norm in the industry in 1992 was to monitor weep holes visually once every hour (Tr. 3408-09). Hourly observations were then entered into a log (Tr. 3514). Foster stated that the monitoring system Arcadian used was the same as was used in the plants where he worked (Tr. 3384).

Recognition of a Hazard/Inspection of Weep Hole System. Bartley testified that following the 1982 turnaround on the R-2 reactor, during his employment with Olin Corporation, he received a copy of a Stamicarbon inspection report which stated that "checks for proper functioning of the weep holes have not

been as careful as they ought to be" on the R-2 reactor (Tr. 2098; Exh. G-36, p.3). The report references Stamicarbon Specification 5869, Leak Detection System (Exh. G-36,. p. 3). The current specification for the Stamicarbon Leak Detection System, 58696, states that the first and main requirement for a reliable leak detection system is free passage from any possible leak to a weep hole (Exh. G-104, p. 3). Stamicarbon specifications make clear that where no continuous gas detection system is in place to detect small leaks some urea may pass undetected into the annulus, where it may crystallize and block the weep holes (Exh. G-104, p. 2).

An April 26, 1983 letter from Stamicarbon regarding the R-2 reactor's leak detection system notes the importance of maintaining the system in order to prevent "considerable damage" to the carbon steel shell, and states that "[t]he leak detection holes should be checked for blockage and proper functioning during turnaround . . . by applying air pressure. . . to one of the leak detection holes in a section and establishing if air emerges from the other leak detection holes in that section." The letter goes on to note that if blockage is found it must be removed (Tr. 2202; Exh. G-109).

Terence Lynch testified that it is the custom and practice in the nitrogenous fertilizer industry to assure that weep holes in pressure vessels are kept clear by forcing steam through the entire weep hole system, and/or by drilling out the weep holes on a regular basis (Tr. 4344-46, 4426, 4435-36). In his written report Lynch's points out that inspection procedures established by the American Petroleum Institute's Pressure Vessel Code 510 require confirmation that weep holes are open (Exh. G-132, p. 18). The API's Pressure Vessel Code 510 **Maintenance, Inspection, Rating, Repair, and Alteration, §3.6 Inspection of Parts**, Seventh Edition, March 1992, which states in relevant part: "Normally weep holes in reinforcing plates should remain open to provide visual evidence of leakage. . .." (Exh. G-198).

Arcadian recognized API 510 as an industry standard (Tr. 7621, Exh. G-72). In May, 1992 Arcadian issued internal inspection guidelines which required inspection of the R-2 reactor every 5 years in accordance with the API 510 guidelines (Exh. G-71, p.3).

Chandrasekaran and Dhume's "Urea Reactor Titanium Leak", in *Fertilizer News,* September 1975, (G-185), and Jojima's "Urea Reactor Failure," in *Ammonia Plant Safety,* Vol. 21, 1979 (Exh. G-188) both recommend regular inspection of the weep hole system. Chandrasekaran and Dhume report that following detection of a leak, and subsequent shut down and repair, weep holes should be flushed to ascertain that all are clear (Exh. G-185, p. 45). Jojima states that plugged weep holes were a "significant factor" contributing to the catastrophic failure of the Columbian reactor, and that to minimize the risk of such accidents, weep holes should always be kept open (Exh. G-188, p. 117).

Finally, James Foster testified that if Arcadian had set up scaffolding for access to all the weep holes, the clogged weep holes would have been detected (Tr. 3326-28; Exh. G-131, p. 11). Foster was familiar with facilities in which the only weep hole access was by ladder (Tr. 4442).

ANALYSIS

As noted above, citation 1(b) charges Arcadian with both failing to adequately monitor the weep hole system for leaks and/or to properly record its observations, and failing to inspect its weep hole system to assure that the system continued to function as intended.

As discussed more fully below, I find that Complainant failed to establish either that Arcadian's leak monitoring or Record keeping practices constituted a recognized hazard, or that the Secretary's suggested abatement methods were recognized within the industry as necessary and valuable steps for a sound safety program in the particular circumstances existing at this worksite. *See, Cerro Metal Products; supra.* I find that Arcadian's failure to assure that its weep hole system remained clear and functioning did constitute a recognized hazard, and that such hazard would have been materially reduced by utilization of the abatement measures set forth by the Secretary.

Items 1(b)[1] and (b)[2] (1) and (3) Monitoring/Record keeping. The record does not establish either that the early recognition of gaseous ammonia leaks in an R-2 reactor is necessary to ensure a safe workplace for employees working in or around the pressure vessel or that Arcadian's method of visually monitoring the R-2's weep holes on an hourly basis posed a serious hazard, or was contrary to recognized safety practices in the industry.

While the record shows that leaking product from the urea vessel may corrode the vessel wall and lead to the catastrophic failure of the vessel, no evidence was introduced which showed that escaping ammonia gases caused such damage, or that a gas leak would develop into a hazardous product leak so quickly that detection of a leak at the gaseous stage was essential to employee safety. Complainant failed to introduce evidence of a single employer actually utilizing continuous monitoring of its pressure vessels for ammonia gases.

Significantly, in its brief, Complainant admits that a visual monitoring system is not inherently defective, arguing only that an automated continuous monitoring system (manometers) would be "more effective," in that it would eliminate the possibility of human error (Secretary's post hearing brief, p. 123). This is insufficient to meet Complainant's burden under §5(a)(1); to establish a violation of that standard, Complainant must show both that Arcadian's monitoring system posed a hazard likely to cause death or serious physical harm, and that the employer's industry recognized the Complainant's suggested abatement as a necessary safety precaution .

Nor does the record support Complainant's contention that inconsistent record keeping poses a recognized hazard. In fact the record fails to reveal any connection between record keeping and employee safety. If, as discussed in item 1(a) above, industry practice is to shut down any pressure vessel upon detection of a leak, such leaks should be reported and acted on immediately, rendering record keeping largely irrelevant.

Finally, it is clear that Arcadian's weep hole monitoring system was adequate to, and did, provide Arcadian with evidence that its R-2 reactor was leaking. Arcadian's failure to act on that information is a separate issue, and is addressed in item 1(a).

Items 1(b)[2](2) and (4) Inspection of the Weep Hole System. Contrary to Arcadian's assertion, it is not necessary that Complainant prove the weep holes in Arcadian's R-2 were blocked at the time of the explosion, to establish the cited violation. Rather the issues are whether clogged weep holes are recognized as a hazardous condition, and whether Arcadian took such precautions as are recognized as necessary by safety experts in the nitrogenous fertilizer industry to prevent such a hazard. *See, Cerro Metal Products, supra.*

The record does establish that both Arcadian and the nitrogenous fertilizer industry recognized that failure to keep a pressure vessel's weep holes clear and in communication with each other posed a hazard, in that the failure of the of the leak detection system may lead to corrosion of such vessel's outer shell and the eventual catastrophic failure of the vessel. Arcadian presented no evidence to the contrary; nor does it argue otherwise in its brief.

The Secretary failed to show that the abatement measure named at 1(b)(2), visual inspection of the weep hole system via platforms, is recognized as necessary for the safe operation of a urea reactor. There is no evidence that platforms affording direct access to weep holes for visual inspections are in use or are recommended by safety experts anywhere in the nitrogenous fertilizer industry outside this proceeding.

However, based on the testimony of Terence Lynch, the API Pressure Vessel Code 510, Stamicarbon specifications and safety literature in the industry, I find that the industry recognized the need to ascertain that all weep holes are open and in communication with each other on a regular basis. The record establishes that, at a minimum, the weep hole system should be inspected during turnarounds and upon the detection of a leak, by forcing steam through the weep holes, to assure that leaking urea has not crystallized in the annulus, and that all weep holes are clear, and communicating with each other. It is undisputed that the weep hole system of Arcadian's R-2 reactor was last tested following repairs conducted in 1989. No similar test was performed during Arcadian's 1991 inspection of the vessel, or following the

detection of a leak in either January or June of 1992. The only test which was performed at that time established that the weep holes at C-5 were *not* in communication with other weep holes in the section.

The Secretary has, therefore, established the violation alleged at 1(b)[2](4), in that Arcadian failed to take steps at the R-2 vessel's turnaround, and once a leak was detected, to ensure that its leak detection system was functioning according to its design criteria.

Citation 1(c)

ISSUES

The final item alleges that Arcadian's R-2 reactor was improperly and/or inadequately repaired, inspected, and maintained. The citation states that Arcadian should have complied with the API 510, ASME, Volume VIII, which requires that critical welds on pressure vessels are performed according to design specifications, meet industry standards, and are subjected to non-destructive testing methods prior to the vessel's return to service.

Arcadian maintains that it cannot be held responsible for repairs made to the R-2 reactor prior to its ownership of the pressure vessel. Complainant does not dispute Arcadian's contention[11] but argues that Arcadian is nonetheless responsible for its failure to discover any improper or inadequate welds during its later inspections (Complainant's post-hearing brief at p. 132, fn. 78). The sole issue for determination, therefore, is the adequacy of Arcadian's inspection of the pressure vessel.

Complainant maintains that Arcadian's inspection of the R-2 reactor was defective in that: 1) inspections were not performed at least annually; 2) the 1991 inspection was not performed by qualified personnel; and 3) inspectors failed to properly inspect the vessel so as to identify defects in the reactor's lining during the 1991 inspection.[12]

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[11] Complainant introduced some evidence that additional welding was performed on the reactor tray clips during the 1991 turnaround, *See* testimony of Brad Gore (Tr. 10742-1082). However, Mr. Gore was unable to identify which tray clips were welded in 1991 (Tr. 10760). Baham and Bartley stated that no welding was performed, on the interior of the R-2 vessel in 1991 (Tr. 8336, 8367, 9782), as did Gary Knipper, project manager for West Cal, the subcontractor who employed Gore (Tr. 8655-56). The Secretary failed to prove, by a preponderance of the evidence, that any welds were made after Arcadian's acquisition of the reactor.

[12] Complainant maintains that the deficiencies in both the inspectors' qualifications and the conduct of the inspection are shown by the condition of the fragmented R-2 vessel, which was examined following the July 1992 explosion. Because the 1989 repairs are not at issue, and because it is impossible to determine how much, if any, of the deterioration found in the R-2 fragments in 1992 was visible during the 1991 inspection, that portion of the record is accorded little weight.

FACTS

Inspection interval. It is undisputed that regular inspection of a urea reactor is performed to determine whether corrosion has occurred, which might allow the product to penetrate the stainless steel liner, and reach the carbon steel shell (*See;* testimony of Anderson, p. 2582).

Complainant points to no published industry standards indicating that Arcadian's R-2 vessel should have been inspected sooner than its actual inspection date in 1991. Section **4.3** of the API 510 Pressure Vessel Inspection Code recommends that vessels having an estimated safe operating life of less than 4 years be inspected no less than every two years (Exh. C-198). The Secretary's proposed Process Safety Management Standard ¶(j)(3)(iii) allows the employer to determine the frequency of inspection based on applicable codes, manufacturer's recommendations and the operator's experience. *See;* 55 Fed. Reg. 29150, pp. 29156, 29165.

The R-2 reactor historically had been inspected at one to three year intervals, in 1973, 1976, 1977, 1987, 1980, 1982, 1984, 1987, 1988 and 1989 (Exh. G-31 through G-39, G-50). On May 6th, 1988, following the 1988 inspection by R. Koster of Stamicarbon, reinspection after about two years was recommended (Exh. G-39, ARCA0000013214). At that time Koster calculated the remaining life of the reactor at 5 years on stream time; Baham testified that Koster's 5 year estimate was the basis for Arcadian's long-term capital planning (Tr. 9777; Exh. G-39, ACLC0000000895).

On May 31, 1988, however, Ronald Allen, an inspection specialist from the Hartford Steam Boiler Inspection and Insurance Company, in an accident prevention report, recommended that "close visual inspection and wall thickness measurements be taken annually" because of the corroded condition of the reactor and the anticipated need for additional weld repairs in the future (Tr. 3949-50; Exh. G-169, OL-009806). The Hartford recommendations were circulated to Olin urea personnel, including E. R. Elsbury and R. Bartley, and were accepted by both (Tr. 3950-51; Exh. G-170). Extensive repairs were indeed undertaken in 1989, and upon their completion, Schoeller-Bleckman made its written recommendation that the R-2 reactor be inspected again after "one year latest" (Tr. 2169; Exh. G-49, G-50, p.4).

Lynch testified that it is the custom within the industry to follow the recommendations of the last inspector, because of the inspector's familiarity with corrosion rates, and the expected remaining life of the liner (Tr. 4350-51). Lynch also stated that after extensive repairs are performed on a pressure vessel, it is the practice to inspect the vessel within 12 calendar months of start up, here September, 1990 (Tr. 4353-57). Finally, Lynch testified that it was the practice within the industry to annually inspect pressure vessels of the age of Arcadian's R-2 reactor (Tr. 4348-50).

Bartley testified that after the 1989 repairs, the R-2 reactor was next inspected in February, 1991, during the first scheduled turnaround for the vessel which followed a year's actual running time (Tr. 2171-72). Baham testified that the R-2 reactor's on stream time between the 1989 repairs and the 1991 inspection was 14 months (Tr. 9666). Baham testified that he believed the 1991 inspection was timely based on the running time elapsed since the last inspection (Tr. 9664-65).

Greleki testified that on-stream time may properly be used for scheduling reactor inspections if the reactor was shut down for a continuous period, *i.e.* several months; however, if the reactor is shut down repeatedly for short periods, it is the same as continuous operation, and inspection periods should be based on elapsed calendar time (Tr. 5121-22; *accord*, testimony of Foster, Tr. 3471-73). LeVine stated that the R-2 reactor was a continuous operation vessel; he opined that Schoeller-Bleckman intended that the reactor be inspected in a calendar year (Tr. 4014). Arcadian's records for 1989 and 1991 (records for 1990 were reported lost) do not indicate any shut downs of several months, the longest shut down recalled by Baham was of approximately a month's duration (Tr. 9663; Exh. G-84A).

Baham also testified that in response to recommendations made in January 1990 by a chemical engineering consultant Arcadian had improved passivation (the introduction of air which reacts with the liner to form a protective layer of nickel or chrome oxide), and reduced the operating temperature in the reactor (Tr. 9165-66, 9179-9181, 9570; Exh. R-163). Because of the modifications made in the operating procedures for the R-2 reactor which he believed would eliminate or minimize corrosion in the reactor, Baham testified that the 1991 inspection was timely (Tr. 9564-65).

Qualification of the Inspectors. The Secretary maintains that the applicable code governing the R-2 pressure vessel inspection is the API 510--Pressure Vessel Inspection Code, which provides:

> **SECTION 2--OWNER-USER INSPECTION ORGANIZATION**
>
> **2.1 General** An owner or user of pressure vessels who controls the frequency of the inspections of his pressure vessels or the maintenance of them is responsible for the functions of an authorized inspection agency, as stated in the provisions of this inspection code. This owner-user inspection organization may also control activities relating to the maintenance inspection, rating, repair, and alteration of these pressure vessels.
>
> **2.2 API Authorized Pressure Vessel Inspector Qualification and Certification** An API authorized inspector employed by or under contract to and under the direction of an owner-user inspection organization shall be educated and experienced. His education and experience, when combined, shall be equal to at least one of the following:
> **a.** A degree in engineering plus 1 year of experience in the design, construction, repair, operation, or inspection of boilers or pressure vessels.

b. A 2-year certificate in engineering or technology from a technical college plus 2 years of experience in the design, construction, repair, operation, or inspection of boilers or pressure vessels.
c. The equivalent of a high school education plus 3 years of experience in the construction, repair, operation, or inspection of boilers or pressure vessels.

In addition, the API authorized pressure vessel inspector shall be certified by an agency as provided in this code. (See Appendix B)

Appendix B states that an inspector applicant must score 70 percent on an examination testing his knowledge of the content of the API 510 and applicable portions of Sections V, VIII, and IX of the ASME Boiler and Pressure Vessel Code (Exh. G-198).

LeVine testified that the API and virtually identical National Board Inspection Code (NBIC)(Exh. G-199, p. 96-97) are recognized as the standard for the inspection of pressure vessels in the loss prevention industry and in the industries it insures, including urea manufacturers such as Olin (Tr. 3944-46). Though Louisiana has not adopted the API 510; there is no pressure vessel code as a matter of state law in Louisiana (Tr. 4032-33), the procedures outlined in the API and NBIC were the industry standard (Tr. 3946). Arcadian was aware that the API and NBIC were considered industry standard by both its insurers and by OSHA. In a 1992 settlement agreement, Arcadian agreed to adopt a pressure vessel inspection program in accordance with the provisions of the API 510 as a result of citations received at its LaPlatte, Nebraska site (Exh. G-103, Settlement Agreement p. 2). A May 28, 1991 memorandum circulated to all plant managers, including Ernie Elsbury, stated that the inspection procedures outlined in the API 510 and the NBIC should be accepted at all Arcadian facilities (Exh. G-72, G-103).

Lynch admitted that Baham met the listed requirements for education and experience under the API 510. Lynch testified that a pressure vessel inspector should have prior experience with the vessel being inspected, and understand the processes, including operating temperatures and pressures, that go on in the vessel; the inspector should be familiar with the mechanisms of corrosion (Tr. 4653-54). Complainant's witness, LeVine, testified that Stamicarbon personnel, who were deemed qualified by Complainant, were not certified (Tr. 4111).

Lynch believed that Baham was not qualified to inspect the R-2 vessel, however, because he was not part of an independent owner-user inspection department, but was mainly responsible for plant production (Tr. 4655-56). Appendix D of the NBIC states, *inter alia,* that it is essential that Owner-User inspectors be "independent of persons responsible for plant production" (Exh. G-199, p. 217). Dr. Grelecki testified that safety decisions should be made by persons whose primary interest is in the safety of the

reactor and who have no interest in production (Tr. 5005, 5163). Ed Anderson testified that although the head of production was included on the inspection team at C.F. Industries, their reactor was also inspected by maintenance personnel including a welding supervisor; an outside contractor took thickness readings (Exh. 2574-80). Inspections were not done solely by production personnel (Tr. 2581). Terry Esthay, who has been doing turnarounds since 1971, testified that, in his experience, inspections are normally done by internal inspection people not connected with production (Tr. 8804-08). However, both Schell and Baham testified that it was the practice of Olin to have its production personnel conduct reactor inspections, calling in Stamicarbon only if problems were detected (Tr. 1872, 1890, 8019-24, 8977-79)

Baham admitted that he was not certified under the API code (Tr. 10137), but stated that he was qualified to perform the 1991 R-2 inspection based on his experience in inspecting pressure vessels since 1978, and upon his witnessing countless welds on pipe and plate (Tr. 9000-33; 9699). Baham also testified that he was familiar with the urea reactor and its corrosion history, as well as urea processes (Tr. 9699-9700), and corrosion calculation (Tr. 2077).

Bartley testified that he was not trained in welding or metallurgy, and was unfamiliar with the calculation of corrosion rates, and of the R-2 vessel's retirement thickness (Tr. 2129, 2218-19). Bartley stated that he was not an authorized inspector under API 510, and was not qualified to be a pressure vessel inspector (Tr. 2219, 8322-23).

Adequacy of the Inspection. The API 510 code, § **3.5 Defect Inspection** requires:

> The parts of the vessel that should be inspected most carefully depend on the type of vessel and its operating conditions. The API authorized pressure vessel inspector should be familiar with the operating conditions of the vessel and with the causes and characteristics of potential defects and deterioration.. . .Vessels shall be examined for visual indications of distortion.. . .Careful visual examination is the most important and the most universally accepted method of inspection. Other methods that may be used to supplement visual inspection include magnetic-particle examination for cracks and other elongated discontinuities in magnetic materials; florescent or dye-penetrant examination for disclosing cracks, porosity, or pin holes. . . radiographic examination, ultrasonic thickness measurement and flaw detection; eddy current examination; metallographic examination; acoustic emission testing; hammer testing while not under pressure, and pressure testing. . . .

Lynch testified that both visual inspection and non-destructive testing is required under the API 510 code and is the custom and practice of the urea manufacturing industry (Tr. 4358; Exh. 132, p. 7). Lynch stated that because of the corrosive nature of urea manufacturing process, non-destructive dye penetrant examination is standard within the industry in addition to visual examination (Tr. 4358, 4662-70). Standard practice includes taking measurements of the thickness of the liner to calculate the corrosion rate and remaining life of the liner (Tr. 4359; Exh. G-132, p. 5-6).

Bartley testified that during the 1991 inspection, he visually examined the liner, and specifically looked at all the each tray clip and overlay welds, as well as each circumferential and longitudinal weld seam (Tr. 8329-31). Bartley stated that all the weld seams were shiny; there was no undercutting, and all the tray clips were in good shape (Tr. 8333). Baham stated that he inspected the color and texture of the lining, and examined it for deformities (Tr. 9678). He testified that he examined each weld for undercutting, corrosion, and pitting (Tr. 9679). Baham stated that he detected virtually no change in the liner's condition since the 1989 repairs (Tr. 9695). Bartley and Baham noted their observations in their equipment inspection report (Exh. G-68).

Baham testified that prior to entering the R-2 reactor in 1991 he reviewed the thickness measurements taken in the course of the 1989 repairs, in order to take measurements in the same manner and locations as the measurements were taken then (Tr. 9723; Exh. G-53, G-69).[13] He and Bartley entered the vessel through a 20 inch diameter flange on the top of the liner (Tr. 9717). Upon reaching the bottom of the vessel they located the intersection of the circumferential and the longitudinal weld in the bottom can (Tr. 9717-18). Baham measured the thickness of the liner above the circumferential weld at C-1 and above and below the welds at C-2 through C-8, using the weld as a reference point (Tr. 9720-21, 9728). Measurements were also taken on either side of the longitudinal welds (Tr. 9728). Baham stated that he took the measurements within a few inches of each other; Bartley transcribed (Tr. 9728). In addition to duplicating the 1989 measurements, Baham and Bartley also measured the thickness of the bottom head and the patches which were installed in 1989 (Tr. 9724-25). Baham specifically testified that measurements were taken above and below the C-7 circumferential weld and on either side of the longitudinal welds which intersected C-7 (Tr. 9766). See also Bartley's testimony (Tr. 8352-8365; Exh. G-68, G-69).

Their measurement technique differed from that used in 1989 in that some of the 1989 measurements were taken using an ultrasound, while they used a permascope (Tr. 9724). The ultrasound measures the thickness of the liner, while the permascope measures the distance from the inside of the liner to the inside of the carbon steel sheath, including any void between the two, so long as the void does not exceed 500 thousandths of an inch (Tr. 9762-63). Baham testified that the permascope provides more useful data, in that its measurements will tell the inspector when the liner needs to be removed to identify an unexplained void in the annulus (Tr. 9764). While Albert Bernson, a welding engineer (Exh. G-129),

[13] The location and means of documenting the measurements taken following the 1989 repairs differed from those in prior Olin inspections in 1978, '80, '82, '84 and '87 (Exh. G-34 through G-38).

testified that the permascope was not appropriate for determining thickness (Tr. 3742-43), Complainant's other witnesses, Foster, LeVine and Grelecki all admitted that the permascope would provide the necessary thickness information (Tr. 3423-24, 3958, 4016-18, 5127-28). Both ultrasound and permascope readings were utilized by Olin in inspecting the R-2 vessel (*See* 1987 and 1988 records, Permascope, Exh. G-38, G-39).

The 1991 measurements for each location were statistically compared to those taken in 1989; at which point Baham found that there was no noticeable difference between the two readings (Tr. 8366, 9767-69, 9774). No calculations were made computing either the corrosion rate or the retirement thickness of the R-2 liner (Tr. 2147; Exh. G-70A).

ANALYSIS

Inspection interval. Complainant failed to establish that the urea manufacturing industry in general required annual inspection of the pressure vessels such as the R-2 reactor. However, Arcadian had ample notice that the R-2 vessel was reaching the end of its useful life and required at least annual inspection to ascertain its continued integrity. In 1988, Olin estimated that the vessel would reach retirement thickness in five years, or in 1992. Arcadian knew, therefore, that the R-2 reactor was nearing the end of its useful life in 1990. In 1988 Olin's insurer recommended annual inspection in its accident prevention report, noting the susceptibility of repair welds to corrosion. In 1989, after the extensive repairs anticipated by the insurer, Schoeller-Bleckman recommended reinspection in no more than a year based on the vessel's past corrosion rates.

The evidence establishes that Arcadian actually knew, or should have known, based on the R-2 vessel's age and well documented history, that the vessel was nearing its retirement thickness, and that annual inspections were required to maintain the vessel's integrity. It is clear that undetected defects or corrosion in the R-2 liner could result in leakage. It has already been shown that such leakage presages the vessel's eventual rupture, a recognized hazard likely to cause death and/or serious physical harm to employees.

Arcadian's contention that it believed its inspection schedule was substantially equivalent to that recommended by its consultants, based on its computation of the vessels on line time, is not persuasive. The record shows that in the urea manufacturing industry inspection frequency is computed on calendar time, unless the reactor to be inspected is off-line for an extended period. The record shows only one shut

down of any length, in September of 1989, which would not materially alter the inspection schedule recommended by Schoeller Bleckman.[14]

The Secretary has established this item as a violation of §5(a)(1).

Qualification of Inspectors. The record establishes that the urea manufacturing industry recognizes a need to utilize qualified pressure vessel inspectors to assure that defects and corrosion in pressure vessels are detected in regularly scheduled inspections, utilizing API and NBIC guidelines. It does not, however, demonstrate that the industry recognized a hazard in failing to use API and NBIC certified inspectors. Complainant also failed to show that Arcadian, or the urea industry would have recognized a hazard in having Dana Bahm perform the inspection of the R-2 reactor, due to his lack of authoritative welding experience, or his association with production.

The evidence establishes that otherwise qualified inspectors were considered acceptable regardless of whether they were actually board certified and regardless of their connection with production. Specifically, Stamicarbon personnel were deemed qualified by Complainant, though they were not shown to be board certified. The record shows that Baham was familiar with urea processes and the R-2 reactor. His testimony demonstrated a familiarity with the appearance and mechanisms of corrosion. His education and experience exceeded the qualifications required under the API and NBIC, less a demonstrated familiarity with the contents of the API itself. Complainant failed to prove that Baham was insufficiently familiar with the API to conduct an inspection in conformance with its principles.

The evidence further shows that plant personnel, including production personnel, conducted inspections at Olin, prior to its sale of the R-2 reactor to Arcadian, and at C.F. Industries. Although the better practice might be to use independent inspectors to avoid any conflict of interest, as suggested in the NBIC guidelines, the evidence does not demonstrate that the industry recognized a hazard likely to result in serious harm in the failure to adhere to the particularities of those advisory standards.

Lastly, nothing in the codes suggests any particular metallurgical background necessary for routine inspection, or the certification of inspectors. Without specific criteria against which to gauge Dana Baham's qualifications, it is impossible either for this judge, or for Arcadian, to ascertain the adequacy of those qualifications.

Complainant failed to establish this item by a preponderance of the evidence.

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[14] Whether Arcadian's inspection schedule was set in good faith is relevant, however, in a determination of willfulness and will be discussed below.

Adequacy of the inspection. The record shows that during their 1991 inspection, Baham and Bartley visually inspected the R-2 liner looking for deformation and/or corrosion. Using the 1989 inspection as a guide, they measured and documented thicknesses in the R-2 liner with a permascope.

Complainant has not proven that the industry recognized as hazardous the failure to use ultrasound to take thickness measurements; its own experts admitted that the permascope would provide the necessary information. Complainant also failed to prove that Bartley and Baham did not take measurements in previously measured locations for purposes of comparison. The record shows that the 1991 measurements were patterned after those taken in 1989, not the earlier Olin inspections relied upon by the Secretary. Complainant has not shown that Bartley and Baham's inspection was so deficient as to be recognized as hazardous by the urea industry.

In the end, the Secretary's case rests on its contention that Bartley and Baham missed open and obvious welding defects which caused the 1992 rupture. Complainant's argument is unconvincing, as it can only be based on evidence examined with the benefit of hindsight, obtained a year and a half and a catastrophic explosion after the inspection at issue.

Complainant has failed to prove this item.

Characterizations of the Violation

To prove a willful violation, the Secretary must demonstrate Respondent committed the violation "with intentional, knowing, or voluntary disregard for the requirements of the Act or with plain indifference to employee safety". *Williams Enterprises, Inc.*, 13 BNA OSHC 1249, 1256-1257, 1986-87 CCH OSHD, §27,893, p.36,589 (No. 85-355,1987).

As *Williams* further states:

> A willful violation is differentiated by a heightened awareness - of the illegibility of the conduct or conditions - and by a state of mind - conscious disregard or plain indifference. There must be evidence that an employer knew of an applicable standard or provision prohibiting the conduct or condition and consciously disregarded that standard. . . .It is, therefore, not enough for the Secretary simply to show carelessness or lack of diligence in discovering or eliminating a violation.

Against this background, the question of whether the Secretary has established a willful violation will now be addressed.

The Secretary sets forth several arguments as to why Arcadian should be found in willful violation of the general duty clause as charged. First, he relies on the evidence of record as establishing that the

violative conduct described above was done intentionally or with plain indifference to employee safety. He goes on to contend that even a good and honorable management employee can be plainly indifferent to or intentionally disregard the requirements of the Act. He emphasizes that Arcadian management had an additional incentive with respect to this conduct, i.e., pressure to produce as much urea as they could make during the subject time period. He also contends that a showing of evil or malicious intent is not necessary to establish willfulness. Stated another way, the Secretary indicates that it does not matter what caused an employer to intentionally disregard or be plainly indifferent to the safety of the workplace. Rather, all that matters is that they were plainly indifferent (Secretary's reply brief 45-46).

Respondent counters that Arcadian did not willfully violate the Act. Arcadian contends that Respondent's management team, including Dana Baham and Bartley, was not plainly indifferent as required for a finding of a willful violation. It contends the evidence of record shows that Arcadian used its best judgment and made reasonable choices in determining to continue running the reactor. It goes on to argue that even if the incorrect decision was made, that does not necessarily equal a violation, no less a willful one (Respondent's brief 306-314).

The undersigned has had the opportunity to closely evaluate the evidence referred to and relied on by both parties in support of their respective positions. In addition, I have had the opportunity to observe the demeanor for several weeks at a time of two of Respondent's key witnesses in this area (Baham and Bartley). My observations and evaluation of their answers indicate that they were indeed sincere in their belief that they believed they acted responsible in this case. I am able to definitely conclude that they were not driven by my desire to make as much urea as possible at the time of the leaks in order to take advantage of a good market price and, therefore, kept the reactor running. In addition, based on their testimony and that of their fellow employees, I agree with the Respondent that management, Baham especially, had a genuine concern for the safety of their co-workers. That can indeed by classified as honorable men.

Having said that, the undersigned still concludes that the actions of Arcadian management in not following the industry practice of shutting down the R-2 reactor upon detection of a leak in the lines of the vessel constituted plain indifference as defined above. The undersigned Judge disagrees with the Respondent that one cannot be in willful violation of the Act and at the same time have no evil or malicious intent and/or be an honorable person. As noted above, Baham and Bartley's attribution twice in a six-month period, of weep hole discharges to sources other than tanks was unreasonable. In the absence of clear evidence to the contrary, Baham and Bartley should have assumed that discharges from the weep holes did, in fact, indicate one or more leaks. As noted above, neither Baham or Bartley could

adequately explain what in the records made them believe that the weep holes at the C-5 weld were different that the other weep holes, monitoring the space between the two repair patches at C-5 rather than the annules. Additional written records were never consulted. It is these factors and my instinct based on over 18 years as a Commission judge that have tipped the scales in favor of the Secretary on the issue of plain indifference to employee safety and, therefore, a willful violation is found.[15] It is my finding that the Secretary for the reasons set forth has shown more than carelessness or lack of diligence in discovering or eliminating a violation as required by Commission precedent..

The undersigned has pointed out that Arcadian management, including Baham and Bartley, the principal players were indeed honorable men not driven by evil intent. I would be remiss if I did not also comment on the Secretary's initial inspection that came under some attach during the hearing. OSHA's conduct, as set forth in the record, from the field inspection to the highest level has been reviewed. I conclude that OSHA conducted a professional investigation that was objective and unbiased at all levels. There is no basis to conduce that there were any irregularities during the inspection and priority proposal phases of the investigation which ultimately led to the issuance of the subject citation.

Before turning to the penalty issue, the undersigned would like to make a few comments of a general nature. First, I would like to compliment both teams of lawyers for the truly outstanding presentation of their respective cases. Their passion from the pre-trial discovery through post-trial briefs for their clients was evident. Actually, it is an understatement to characterize this matter as hard-fought on both sides. However, what was so helpful to me was the fact that, while protecting their clients, they never lost focus and kept the matter on course. The lead attorney for the Government, Ms. Withrow, as well as all the litigators, were able to present a complicated case in a clear manner regardless of which attorney presented the witness on a particular day. This took intense preparation. Many times, these thoughts are left unsaid by a trial judge.

Having said this, the next step in the process if for my aggrieved party to seek review from the Commission for any perceived errors of law or fact by the trial judge. Having been on the bench for several years now, I am, of course, completely familiar with this procedure. Rest assured, the above comments, earned by Counsel on both sides, should not be interpreted to deter, as I am sure they would

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[15] The record does not, however, establish that the violation at item 1(c) was willful, in that Arcadian established its good faith belief that it had substantially complied with the recommendations of its consultants in computing its inspection schedule using on-stream times. *See; Calang Corp.*, 14 BNA OSHC 1789, 1987-90 CCH OSHD ¶29,080 (No. 85-319, 1990) [Violation was now willful where employer's belief concerning a factual matter - was reasonable under the circumstances.]

not be, from aggressively seeking review of any part of my decision they disagree with. That is the system in place and it is there for that purpose. However, I do make one request. At times, Counsel sent me copies of their petitions for review and appeal briefs to keep me informed of appellate actions in this case. I would specifically discourage that practice since the history of this case makes it the first one in my 18 years on the bench that I would like to dispatch to Washington and go on to other cases. It is anticipated that I will be back on case rotation in the near future and I can return to my previous adjudicatory duties. Let me emphasize that the history I refer to does not pertain to the actual litigation, trial counsel and writing of the decision. My interaction with counsel, the noel issues, hundreds of trial rulings, etc. had definitely kept this trial judge on his toes. In fact, I sincerely believe that, if we began this litigation today, there is not one ruling on decision that I would change with respect to both this case and the serious portion, presently pending before the Fifth Circuit.

Finally, I think it appropriate to thank the support staff of the now closed Dallas office for their invaluable help in keeping up with the volume of work this case generated up to the April 30, 1996 closing, while managing that other full caseload in the office. It is also appropriate to recognize the Denver support staff, which inherited the task of typing, docketing, indexing, etc. the voluminous record in this case for transmission to Washington, D.C. in the next three weeks. At the same time, it is important to point out the invaluable assistance the undersigned judge has received from two Commission attorneys at the Regional level that enabled me to expeditiously move this case along. Their assistance was invaluable in, among other things, meeting the novel issues, etc. raised by counsel from day one of this trial. I am referring to Ms. Pamela Merrifield of the now closed Dallas office and Ms. Christian Reid here in the Denver Regional Office. With the complexity of Commission cases increasing as we speak, their presence at the regional level and at the Chief Judge's office in Washington, D.C. are greatly appreciated.

Penalty

The Secretary has proposed a penalty of $50,000.00.[16]

The gravity of the cited violations is high, the evidence supports the Secretary's contention that the rupture of a pressure vessel placed 87 employees in danger of serious harm, including possible loss of life. No credit is available based on size, as Arcadian is a large company, with over 250 employees. Nor is any credit available based on history; Arcadian has a significant history of prior OSHA violations. (*See,* testimony of Berrien Zettler, and Mark Briggs; Tr. 5394-97, 5628-39). No credit for good faith is available for good faith where a violation is found to be "willful."

The maximum statutory penalty allowed for a "willful" citation is $70,000.00. The Secretary found that the maximum penalty was not warranted in this case because there were no fatalities, the number of employee injuries was relatively low, and the employer had made some, albeit inadequate, efforts to come into compliance with the OSHA's recently promulgated process safety management standard (Tr. 5398).

Taking into account the relevant factors, I find that the proposed penalty of $50,000.00 is appropriate, and that amount will be assessed.

ORDER

1. Willful Citation 1, items 1(a), and 1(b), alleging violations of §5(a)(1), are AFFIRMED.
2. Citation 1, item 1(c) is, alleging violation of §5(a)(1) is AFFIRMED as a Serious violation.
3. A combined penalty of $50,000.00 is ASSESSED.

_/s/_____
Stanley M. Schwartz
Judge, OSHRC

Dated: March 12, 1997

[16] The parties were given the opportunity to brief the issue of "egregious" penalties for the benefit of any reviewing court, or this judge in the event of a remand. As that issue has already been decided by the Commission in *Arcadian Corp.*, 17 BNA OSHC 1345 (No. 3270, 1995), it will not be addressed again here.