

ILLINOIS POLLUTION CONTROL BOARD
October 6, 1983

IN THE MATTER OF CHAPTER 8: NOISE)
POLLUTION, RULE 206, SITE SPECIFIC)
OPERATIONAL LEVELS FOR FORGING SHOPS)
) R82-31
Amforge Division of Rockwell) Dockets A, B, and C
International)
Modern Drop Forge Company, and)
Wyman-Gordon Company)

FINAL ADOPTION.

OPINION OF THE BOARD (by J. D. Dumelle):

On November 3, 1982, the Amforge Division of Rockwell International (Amforge), Modern Drop Forge Company (Modern) and the Wyman-Gordon Company (Wyman-Gordon) individually petitioned for site-specific operational levels for their forging shops, as alternatives to compliance with the noise limits contained in Rule 206 of Chapter 8: Noise Pollution. All three petitions were accepted by the Board on November 12, 1982. By Board Order Amforge was assigned to Docket A of this proceeding, Modern to Docket B, and Wyman-Gordon to Docket C. That Order also served to incorporate the record in R76-14, the general rulemaking on impulsive noise from forging shops. The Illinois Environmental Protection Agency (Agency) filed its Recommendations on February 9, 1983. The requisite public hearings were held in Harvey, Illinois on February 15, 1983. No members of the public attended and no public comments were received on any of the three Dockets. First Notice was adopted on May 19, 1983 and was published at 7 Ill. Reg. 7243. On July 22, 1983 the Board ordered the proposed rules to Second Notice and the Joint Committee on Administrative Rules certified no objection on September 22, 1983.

Each petition was filed pursuant to subparagraph (d) of Rule 206: Impact Forging Operations, which was adopted on July 21, 1982 as a part of the R76-14 rulemaking, and became effective on September 1, 1982. As indicated above, Rule 206 contains the numerical limits for noise generated by forging shops. It also provides an alternative. Specifically, subparagraph (d) allows an existing forging shop to petition the Board for a site-specific operational plan which in effect will limit the shop's noise emissions. The petitioner, must demonstrate that it is technically and economically impractical for its shop to meet the numerical limits. Each petitioner must not only explain its inability to comply with the numerical limits, but must also propose the means for reducing impulsive noise as much as possible and assess the consequential health and welfare impacts on the surrounding community. Subparagraph (d) also sets out the procedural format for this type of relief. The petition must include the nine points of information delineated in the Rule; the Agency is to

submit a Recommendation on the petition; and a public hearing must be held. For each Docket, all three requirements were satisfied.

Following is a separate discussion of each Docket, including a description of the individual facility, its inability to abate noise through structural or operational changes, its past abatement efforts, and its proposed plan, if any, to reduce impulsive noise. The economic ramifications and acceptability of each proposed plan are also discussed.*

DOCKET A: AMFORGE DIVISION OF ROCKWELL INTERNATIONAL

The Amforge complex is located on 119th Street, between Loomis and Racine Avenues in Chicago, covering approximately four city blocks, or seventeen acres. Two buildings, the axle and hammer shops, house the Amforge forging operation which manufactures, among other items, parts for the agricultural, off highway equipment, trucking, railroad, and construction industries. Amforge has twelve hammers ranging from 3,000 to 12,000 pounds to manufacture forgings ranging in size from three to three hundred pounds. Very simply a forging hammer consists of two dies, each of which is attached to a guided ram and an anvil. The metal to be shaped, i.e. forged, is placed between the ram and anvil. The guided ram with its die is then driven against the lower die atop the anvil. The impulsive sound is generated by the resulting impact. Fifteen furnaces service Amforge's hammers, each with the capacity of heating approximately 5,000 pounds of metal per hour. To bring the steel to forging temperature, the furnaces must reach 2,350 to 2,400 degrees Fahrenheit. (Pet. 3,4, and R.21).

The hammer shop is forty feet high, ninety feet wide and one hundred and seventy feet long. The axle shop is likewise forty feet high, but fifty feet wide and one hundred feet long. Both buildings are similarly structured with fiber-glass doors on the bottom, windows above that, and roofs of corrugated sheet metal. The buildings have been designed to create the "stack effect", that is natural ventilation of the furnaces' heat. Inside air, heated by the furnaces, induces the outside cooler air into the building through the multiple large door openings, causing air currents to rise and exhaust through vents on the roofs. The shop's noise, impulsive and otherwise, is also emitted through these vents.

The axle and hammer shops were built about forty years ago. At that time the surrounding area had few residential houses. Now, the areas south and east of the complex are primarily industrialized, including a junkyard, a railroad switching yard and other noise generating industries. (Exs. D & E). Only to the north and west are there residential properties, most of them constructed since 1945. (Pet. 2,3 and R.19). These residential areas qualify for Class A protection. Petitioner estimates, based

*While these amendments were in First and Second Notice, pending final action, Chapter 8: Noise was codified pursuant to the Administrative Procedure Act (Ill. Rev. Stat. 1981, ch. 127, par. 1001 et seq.). Chapter 8 is now contained in 35 Ill. Adm. Code Subtitle H: Noise, and Rule 206 is at Section 901.105 of that Subpart. The remainder of this Opinion uses the codified numbers.

on the daytime noise limits of 58.5 Leq, that its operation's noise levels could affect one hundred and fifty-five residences. If the nighttime level of 53.5 Leq is used, this number is increased by four hundred and eighty-eight possibly affected residences (Pet.10).

Amforge currently employs 145 persons. It employed as many as 600 in 1979. It can operate three shifts, six days a week; that is from 7:00 a.m. until 3:00 p.m., 3:00 p.m. until 11:00 p.m., and 11:00 p.m. until 7:00 a.m. It has not, however, since 1979 operated the third shift, and as of January 19, 1983 the facility was mothballed for at least six months. The chart below provides the approximate number of forgings, the total tonnage of forgings, and number of blows creating impulsive noise for the years 1979 through 1981 (Pet.5). At hearing Amforge added that 10,142 tons were forged in 1982 and estimated that less than 5,000 tons would be forged this year. (R.25).

	<u>No. of Forgings On Hammers</u>	<u>No. of Blows</u>	<u>Tonnage of All Forgings</u>
1979	1,016,744	14,234,416	26,422
1980	698,025	9,772,350	15,806
1981	474,940	6,649,160	14,566

Having monitored its noise levels in 1980 Amforge represented that the highest level recorded at nearby residences was 70 Leq. (Ex.C, R.27). In order to reduce this level to that required at Section 901.105(c). Amforge investigated three different means for abating the impulsive noise. The first would have required that the ground level openings, the windows, and the roof vents be enclosed. This alternative would have meant that the "stack effect" of the buildings would be forfeited and replaced with mechanical ventilation. Mechanized ventilation would entail exhaust fans and silencers placed on the rooftops. A single fan and silencer would weigh approximately 2,410 pounds. (R.37). Amforge estimated that eight fans with silencers would have to be installed atop each building. The cost per ventilator was estimated at \$4,325 apiece, or \$69,200 total, while the cost per silencer was estimated at \$2,650 apiece, or \$42,400 total (Ex.I). Regardless of cost, Amforge did not believe that the rooftops of either building could support the weight. (R.37).

In addition to mechanical ventilation, Amforge considered building barriers outside of the building to obstruct the noise emitted through the ground level doors. The barriers were proposed to be one hundred to two hundred feet to the north, west, and east of the shops. Not only do personnel and air move through these doors some eighteen feet wide, but also materials to and from the operation, e.g. fuel oil, steel used in the operation, and cooling forgings. Should the barriers be constructed, Amforge testified that they would obstruct these essential movements thereby impairing the shop's operations. (R31-34). Amforge also

cited testimony given by forge shop workers during the R76-14 rulemaking. That testimony indicated that should the doors be closed and barriers be constructed, the shop employees would suffer from the furnaces' heat and experience a discomforting effect from the loss of natural light, which in turn would greatly affect productivity (R.76-14, February 23, 1981, pp. 270-274 and 429-431). (R.34-35).

Initially the barriers were proposed by Amforge's noise expert. Their distance and height from the shop were based on the classical diffraction theory for optics. However, sound measurements have since indicated that the wind changes the diffraction patterns so significantly that the barriers would not be effective downwind (R.59). This same phenomena means that should the bottom half of the shop be enclosed and the sound directed upwards through the roof and towards the sky, the wind could direct the noise waves towards the ground. Thus the shop would have to be totally enclosed.

The last alternative considered by Amforge was to pad the hammers. Absorbent pads made out of Fabrika, could be placed on the hammers' mechanical parts when each individual hammer is overhauled. (R.39). Amforge's noise expert believed that proper placement of the pads might reduce the acceleration forces, thereby reducing some of the forge frame's vibrations. Reducing the ringing on all the structures may seem to somewhat lower the total sound omitted, however, the pads would not effectively reduce the highest sound level impacts, that is the impulsive sound. (R. 57).

This same noise expert took the noise readings in the area of the Amforge shop. As stated earlier, these measurements indicated the highest Leq to be 70. The isopleths developed from these measurements demonstrated that residences downwind suffered from higher noise levels. The difference between downwind and upwind was as much as approximately two decibels per 100 feet from the shop. Therefore, at 1000 feet the difference between a downwind or upwind location would be twenty decibels. Given this, the number of affected residences mentioned above must be qualified. During the daytime it is likely that only a part of the one hundred and fifty-five residences, those directly downwind, would experience levels greater than the allowable 58.5 Leq whereas the levels upwind may be below that level. The same holds true for the additional four hundred and eighty-eight residences originally considered to be exposed to levels greater than the nighttime level of 53.5 Leq.

The Agency's Recommendation assessed the ability of the Amforge facility to abate sound, and the health and welfare effects on the nearby community should it not. Principally, the Agency considered acoustical strengthening. This would require reducing the number of ventilation openings, installing duct silencers at ventilation openings and gravity ventilators at the

roof openings. The Agency agreed with Amforge that these three efforts would hamper the "stack effect" this shop depends on. As for the impact on the nearby community, the Agency found that only thirteen homes would receive levels as high as 70 Leq, while an additional thirty-six would receive levels as high as 65 Leq; 101 a level as high as 60 Leq, and 119 homes impacted at levels as 55 Leq. The Agency's Recommendation also notes that since 1972, no citizen complaints have been received about the Amforge facility. In assessing the health and welfare effects, the Agency's Recommendation cited the United States Environmental Protection Agency's document "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety". (Recommendation, Ex.8) This study acknowledged that it is difficult to access the effects on health caused by impulse noise because it is necessary to take into account other factors such as the background noise, and the number and duration of the daily exposure. The study found that impulse noise exceeding background noise by 10 dB is potentially sleep disturbing and startling. However, the study concluded that no threshold level could be identified, or that there was any clear evidence of permanent effect on public health and welfare.

As its alternative compliance program, Amforge proposed three operational changes. It has agreed to reduce the number of operating hammers from twelve to ten; limit operations to two shifts which will mean the forging shop will operate from 7:00 a.m. until 11:00 p.m., and occasionally from 6:00 a.m. until 12:00 midnight; lastly, as the hammers are overhauled (approximately every three years), the sound absorption pads described above will be installed. Amforge estimates that removing two hammers from operation and curtailing the hours of operation to sixteen per twenty-four period its potential forging operation is reduced by 39.1%. It could not, however, express this cutback in a dollar amount.

It should be noted that the Amforge petition lists sound abatement measures taken at the facility since 1972. For instance, mufflers, silencers, and snubbers were installed on hammers, presses, and on air compressors; eleven hammers were removed from service; part of the hammer shop was rebuilt with noise insulating materials; and the ground level doors were repaired or replaced. Some of these efforts directly reduced the amount of impulsive noise, while other abated other manufacturing noise. The costs of these improvements ranged from \$1,803,000 for rebuilding part of the hammer shop, to \$3,800 for the work done on the ground level doors.

The economic impacts to the individual shops, to the State and otherwise were initially considered in the R76-14 proceeding. The Economic Impact Study submitted by the then Institute of Natural Resources did investigate the cost of abatement for ten individual forging shops. Amforge was one so studied. The

combined capital and operating costs for reducing noise emissions by successive 5 dB increments in 1978 dollars was estimated to range from \$424,000 for a 5 dB(A) reduction to \$714,000 for a 15 dB(A) reduction. (INR Document No. 78/03, pp. 39-40) Although Amforge along with nine other shops, was individually examined, these dollar amounts were standardized for purposes of the report.

DOCKET B: MODERN DROP FORGE COMPANY

Modern's facility occupies approximately four blocks immediately northwest of the intersection of 139th Street and Western Avenue in Blue Island, Illinois. The first forge shop was constructed in 1918, and a second built in the 1940's. Since then numerous support buildings have been added. Modern operates twenty-one hammers and numerous furnaces. The air drop, air driven hammers range in size from 2,000 pounds to 8,000 pounds, while each furnace can heat up to 1.3 tons of steel per hour to a temperature of nearly 2,000 degrees Fahrenheit. The forgings produced range in size up to forty pounds and include among other items connecting rods for engines, pinions, and gears for the railroad industry, and shifting levers for transmissions.

Modern currently employs 263 persons (R. 16). Historically, Modern operated two shifts from 6:00 a.m. until midnight, with occasional Saturday shifts from 6:30 a.m. until 7:30 p.m. Currently, the forging operation is from 6:30 a.m. to 10:15 p.m. five days a week. The chart below provides the approximate number of forgings manufactured, the total tonnage of forgings, and the number of blows creating impulsive noise for the years 1979 through 1981 (Pet. 5). At hearing, Modern estimated that 7,200 tons were forged in 1982 and approximately 8,000 tons would be forged in 1983 (R. 17).

	<u>No. of Forgings On Hammers</u>	<u>No. of Blows</u>	<u>Tonnage of All Forgings</u>
1979	24,800,000	109,282,000	15,900
1980	18,800,000	92,475,000	13,350
1981	12,746,000	67,477,000	9,780

Modern is primarily surrounded by other industrial facilities. Directly north is a warehouse and trucking operation, east a roofing company, and directly south in one industrial park is another roofing company, a potato processing plant, incinerator manufacturer, and pattern works. Numerous scrap yards and railroad switching yards are also in the vicinity. A girls school is directly east of Modern, while trailer parks are northeast, east and southeast of Modern. Like Modern, however, these residential areas are surrounded by industrial

complexes and switching yards (Ex. A). Nevertheless, these residential areas qualify for Class A protection under Subtitle H. More specifically, impulsive sounds impacting them must not be more than 58.5 Leq during daytime hours, and 53.5 Leq during nighttime hours pursuant to Section 901.105(c).

Sound measurements were taken by Modern using both the Leq measure and dB(A) (fast meter response). Data taken on dB(A) was converted to Leq by deducting 5 dB. Excluding two residences owned by Modern, the highest emission at the closest Class A Land measured 67 Leq (Pet. 9). Using concentric circles, Modern illustrated the different noise parameters effecting the various residential locations. The diagram indicates that the girls' school, the northern trailer park, and part of one to the southeast of Modern fall within the 65 Leq or greater range. The two smaller trailer parks to the east and the remainder of the southeastern park are within the 55 Leq. to 65 Leq (Ex. A). Petitioner estimated that 1,639 residences are potentially exposed to sound levels greater than 53.5 Leq (Pet. 9).

Modern's two forging shops are of similar design. The lower level is composed of brick with large roll-open doors. Above that are wire glass panels on one building, and corrugated fiber glass and steel panels on the other. One roof is gypsum board and asphalt with a corrugated transite peak, while the other is a corrugated transite roof. Atop both buildings are large open roof ventilators while along with the buildings' design provide for natural ventilation of the furnaces' heat, commonly referred to as "stack effect". The impulsive sound from the forging hammers also exits through the roof ventilators; thus, the relationships between adequate ventilation and sound emitted.

Modern considered two abatement strategies. The first entailed totally enclosing the shops and installing mechanical ventilators. Structural analysis of both buildings indicated that the present trusses and related structures would have to be extensively modified to support the deadweight associated with additional exhaust units. Seven additional units weighing 1,300 pounds apiece would be needed for the older, smaller shops which currently has six trusses. Ten units weighting approximately 7,740 pounds apiece, in addition to the present eight, would be needed at the newer and larger of the two buildings (Ex. F). Modern claims that for the same structural reasons, sound absorptive material cannot be installed.

A second means for abating sound would be to construct barriers between the shops and receiving Class A areas. Since 1976, Modern has built five structures between itself and the southern and eastern perimeters, and is currently erecting a sixth. In locating these buildings, Modern had intended to obstruct the impulsive noise caused by its operations. In building these new structures, Modern used sound absorptive brick, at an increased cost of approximately three and a half times that of normal building material. One structure was also constructed to a height recommended to obstruct sound movement (R. 20-21).

Lastly, Modern enclosed the upper side vents on its larger building (R. 22). This was intended to direct noise skyward, and also to improve the "stack-effect". While it did improve the natural ventilation, the workers objected (R. 38).

Modern also considered constructing barriers. To be effective, it was thought these barriers would have to be close to the forging shops. They would thus interfere with the facility's craneway and forklift routes (R. 28, 29, Ex. D, E). Modern also introduced testimony from the R76-14 proceeding, as to the effect such barriers would have on its employees. Since the barriers would have to be constructed close to the shops, they would in effect cut off light and air (R. 30). Two employees of forging shops, one from Modern, testified that would create intolerable working conditions (R. 76-14, February 23, 1981, R. 270-274; R. 429-431).

In taking the sound measurements, the buildings and other barriers were found ineffective at distances greater than 200 feet beyond the barrier because weather conditions affected the noise pattern. Locations downwind registered higher noise levels than those upwind from the source. Even without wind, weather conditions interfered with the barriers' intended effectiveness. On sunny days, the heated ground causes the noise to be diffracted upwards very rapidly (R. 43-96). Thus, the barriers, regardless of height or material specifications, failed to stop impulsive noise from reaching Class A Land. Evidence of this diffraction pattern, incidentally, is the reason Modern used concentric circles rather than irregular isopleths to illustrate noise patterns.

Modern was only aware of one complaint about the impulsive noise generated from its neighbors; which was made in 1977 in response to 2:00 a.m. operations. Modern has since discontinued the then experimental early morning third shift (R. 24). During the R76-14 proceeding Modern also conducted a survey of the affected residences and only one complaint was registered (R. 76-14, February 24, 1981, R. 433-435, 441-444). The Agency's Recommendation cited no known complaints. Furthermore, the Agency estimated that only 5% to 10% of the 1,639 homes considered by Modern would receive levels as high as 67 Leq.

Pursuant to Section 901.105(d)(2)(G) petitioners for a site-specific rule are to include proposed operational levels and physical abatement measures, if any, which are intended to reduce the facility's impulsive noise. Modern does not propose to change its operations or, in the future, install or construct sound abatement mechanisms. However, since 1976, Modern has undertaken six construction projects which directly and indirectly were intended to reduce impulsive noise. Modern not only designed and located building construction to act as barriers, but also used sound absorptive material on those walls facing the forging shops. Modern also closed the upper vents on the larger shop and the southern end of the smaller shop (R. 23). Modern is also in the process of installing sound attenuators on its dust collectors.

This last measure will not reduce impulsive noise, but should effectively reduce other noise emitted to nearby residences. Cumulatively, Modern estimates that the sound abatement measures associated with these construction projects have cost approximately \$24,000 (Pet. 7-8). The R76-14 Economic Impact Study estimated that it would cost Modern \$424,000 to reduce impulsive noise by 5 dB(A) and up to \$1,231,000 to reduce it by 20 dB(A) (INR Document No. 78/03, p. 39-40). A 20 dB(A) reduction was then considered necessary for Modern to comply with the numerical noise limitations.

Modern represents that future efforts to reduce impulsive noise to compliance levels would require total enclosure of its two shops, thereby eliminating the buildings' "stack effect". Replacing natural ventilation with mechanized ventilation is not feasible given the buildings' current structure. Enclosing the shops is also unacceptable from a productivity viewpoint. Large materials must constantly be moved in and out of the buildings, and the shops' employees would not accept conditions which would shut out natural light and air.

Historically, Modern has not operated an early morning third shift. It cannot, therefore, propose to eliminate it. Modern does request that it be allowed to operate between 6:00 a.m. until midnight, although it ordinarily operates no later than 10:15 p.m. Therefore, those residences located only within the nighttime noise limit parameter, will be adversely affected for no more than two hours per week day. Impulsive sound is considered disruptive to sleep according to the USEPA document "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety". (Agency Recommendation, Ex.8) That same document, however, did not establish a threshold level for health or welfare impairment. The Board notes that no complaints have been filed in the recent past concerning Modern's forging operations. Perhaps the industrial character of the area renders Modern's impulsive noise less obtrusive.

DOCKET C: WYMAN-GORDON COMPANY

Wyman-Gordon's facility is located on approximately 66 acres immediately north and northwest of the intersection of 147th Street (State Highway 83) and Wood Street in Harvey, Illinois. Ten forging units, each consisting of two hammers, are housed in four separate buildings, identified as Nos. 6, 7, 67 and 75. The steam driven hammers range in size from 10,000 pounds to 30,000 pounds, and produce forgings ranging in size from twenty-five to over 1,000 pounds. The forgings produced include among other items crankshafts for agricultural and off-road equipment, parts for the aircraft, the aerospace and the under sea exploration industries. The table below provides the approximate number of forgings manufactured on these hammers, the number of blows

creating impulsive noise, the total number of forgings and the total tonnage of forgings for the years 1979 through 1982. (Pet. 6, R.17). At hearing, Wyman-Gordon projected that 11,000 tons would be forged in 1983.

	<u>No. of Forgings On Hammers</u>	<u>No. of Blows</u>	<u>Total No. Of Forgings</u>	<u>Tonnage of All Forgings</u>
1979	319,136	6,382,720	475,260	55,646
1980	220,684	4,413,680	344,863	42,732
1981	163,485	3,169,700	285,657	38,629
1982		1,175,980	58,799	7,590

Wyman-Gordon began its operations on 1919. Although four buildings previously contained hammer units, the single unit in Building 67 has been shut down. Therefore, three buildings constructed before 1940 now house the remaining units and thirty to forty furnaces. Individually, these furnaces are capable of heating up to 16,000 pounds of steel per hour to a minimum of 2,200 degrees Fahrenheit. To exhaust the tremendous heat generated, all three buildings were designed to create a "stack effect" for natural ventilation. The end walls are partially made of brick with some upper level windows and corrugated asbestos siding. The principal walls have numerous grade level doors and side wall windows. Roofs are of federal cement tile with a monitor containing operable sash windows. The ground level doors, side windows, and roof windows are all necessary openings for ventilation. It is through these same openings that impulsive sound is emitted. Currently, Wyman-Gordon employs 380 persons, and at the time of petitioning it employed 600 persons. (R.15, Pet.4). At this time the forging hammers are operated between 7:00 a.m. and 3:00 p.m. Historically, the hammers were operated during two shifts, from 7:00 a.m. until 11:00 p.m. six days per week. Occasionally, isolated units begin at 6:00 a.m. or end at midnight. A third shift has not traditionally been utilized.

Wyman-Gordon's facility is surrounded by residential property which qualifies for Class A protection under Subtitle H. The plant and Wood Street is bisected by two railroads. An average of eighteen trains operate daily, which along with a manufacturing complex to the west contribute noise to the area. Wyman-Gordon estimated that 1,263 residences are potentially exposed to levels in excess of 58.5 Leq. and 794 additional residences exposed to levels exceeding 53.5. These measurements are respectively the daytime and nighttime maximum exposure levels allowed under Section 901.105(c).

The highest noise level, measured and therefore anticipated at the closest Class A Land is 74 Leq. The 74 Leq. measurement was taken in the vicinity of only three to four homes, which were just north of Building 75. Wyman-Gordon qualified this as the worst case condition, only occurring on days when these residences were downwind. The total number of residences was likewise qualified; only those in downwind quadrants receive levels greater than allowed by Section 901.105. Therefore, the entire number of potentially affected residences would not be subject to excess levels at any one time. (Pet. 9, 10, R. 19).

Wyman-Gordon has over the years already taken steps to reduce the noise, impulsive and other, emitted beyond its perimeter. Between 1952 and 1978 it expended \$462,937 to acquire approximately twenty-one acres contiguous to its property. This land is vacant and acts as a buffer between the plant and nearby residences. Secondly, in 1979 Wyman-Gordon installed two roof ventilators at Building 75, at a cost of \$84,000, not including internal engineering and labor costs. Each vent is nine feet wide by ninety feet long and directs heat and impulsive sound upward. Each ventilator contains two vertical panels, each lined with glass fiber sound absorptive material. Installation of the ventilators allowed the openings on Building 75's north side to be closed. Northern residences, when downwind, benefit by a sound reduction of approximately 4 decibels. (Pet.8). In 1982, Wyman-Gordon shut down two hammer units, each consisting of two hammers. Both units were contained in buildings on the facility's southern boundary. In eliminating one of two units in Building 7, and the only unit in Building 67, the potential for excess levels impacted residences to the south was reduced. (R.18, Pet.8). Lastly, between 1974 and 1979 Wyman-Gordon installed mufflers to reduce non-impulsive noise from all its steam vents at a cost of \$32,000.

Wyman-Gordon considered totally enclosing the three remaining forging shops, Buildings 6, 7, and 75. However the cost, size and weight of the necessary exhaust fans, silencers and duct systems were prohibitive economically, but more important, structurally. (R.26). For example, two silencers would be required at Building 75 costing a total of \$12,000, along with four ventilation fans at \$84,000. Duct work for Building 75 was estimated at \$181,700. (Ex.H). Regardless of the high cost, Wyman-Gordon testified that the three buildings would be unable to support the weight associated with mechanized ventilation without substantial reinforcement of the present structures. (R.26).

Wyman-Gordon also considered constructing four barriers. The one proposed at the facility's north end would, however, obstruct a craneway and the roadway providing access for street trucks to and from its principal steel yard. A new roadway was estimated to cost a total of \$114,365. (Ex.F, R.22).

Construction of a second barrier at the southern end of the facility, would interfere with the movement of steel in and out of one building. To maintain production levels, an additional truck and driver would be needed at an estimated annual cost of \$125,398. (Ex.6, R.23). Yet two more barriers at the southern end would obstruct a craneway and the shops' natural ventilation and light. (Ex.E, R.24).

Wyman-Gordon proposed both physical changes and operating changes in order to reduce impulsive sound received at nearby Class A Land. Primarily, Wyman-Gordon will concentrate its forging operation to Building 75, which is approximately one-fifth of a mile north of its southern forging shops. Buildings 6 and 7 will therefore not be used for more than 20% of the total operation. Already Petitioner has eliminated two units operating in Buildings 7 and 67, which are located at the southern edge of its property. It is further willing by January 1, 1984, to remove another unit from operation. That will mean a 40% reduction of the ten units previously operated.

As noted above, it was Building 75 which had its northern facade closed to reduce noise emitted to northern residences. In an effort to further reduce noise to the north, Wyman-Gordon proposes to consolidate two existing steel stockpiles into one which is to be located north of Building 75. The consolidated yard is to act as a noise barrier during ideal atmospheric conditions. (R.29, Pet 13). Like other barriers, its intended purpose is defeated whenever wind or heat diffracts noise over it. (R.41, 44). At best, the stockpile should reduce noise levels by 1 dB or more. (Pet.13).

Wyman-Gordon is aware of the ineffectiveness of barriers because four other buildings are already located just north of Building 75. These building shield all but one of the units in Building 75. In theory, these buildings should produce an approximate 20 dB reduction. However, measurements indicate that noise is reduced by just 3 dB (R.45). Nevertheless, Petitioner proposes to consolidate its steel yard in a location to shield the one unit not already blocked to the north.

Lastly, Wyman-Gordon proposes to limit the amount produced during its hours of operation. Forging operations will continue as before, primarily between 7:00 a.m. and 11:00 p.m. six days a week, and occasionally beginning at 6:00 a.m. and ending at midnight, with occasional Sunday shifts. However, it proposed to restrict operations during the latter to 2% of its annual total hammer productions. (R.27,30,54). In addition to these efforts, it is noted that Wyman-Gordon has already invested money and action towards consolidating production at Building 75. Building 75 was itself renovated and partially enclosed, and Building 67 eliminated as a forging shop.

The past efforts and future consolidation Wyman-Gordon estimates will cost nearly \$2,000,000. (R.30). The Economic Impact Study estimated that for the Wyman-Gordon facility to reduce impulsive noise emissions by 25 dB(A), the amount necessary to be in compliance with numerical limits, was \$1,715,000. That was based on 1978 dollars, which also had been standardized in a study of ten forging shops. (INR Document No. 78/03, pp. 3940). The plan now proposed by Wyman-Gordon will cost approximately the same amount, but is anticipated to reduce the noise level by 1 to 3 dB(A). The difference in cost is due not only to inflation, but because it has now become apparent that shops like Wyman-Gordon cannot be totally enclosed and that sound barriers do not perform in actuality as formerly believed in theory. Inability to enclose and inefficiency of barriers accounts for the difference in noise reductions anticipated.

CONCLUSION

In adopting the alternative of site-specific operational levels in R76-14, the Board concluded that given these figures and other information made it apparent that a number of small Illinois forging shops could not achieve the necessary noise abatement for reasons technical and economic. Therefore, instead of a standard noise level the shop's operational plan becomes the rule within Subtitle H and the individual shop must comply with it. In no instance may such a plan allow an increase in existing decibel levels, measured in Leq.

In the matter of Docket A, the Board accepts Amforge's assertion that the two buildings could not structurally bear the weight mechanized ventilation would entail. Therefore, the only means for totally enclosing the hammer and axle shops would be to rebuild the existing buildings. Secondly, the formerly acceptable abatement measure of barrier construction has been discredited as an effective method to reduce impulsive sound. It then appears that impulse forging noise can only be reduced in this case through operational changes. Amforge has agreed to eliminate its late night work shift as well as two of the twelve hammers. In addition, Amforge has agreed to reduce the noise generated by the remaining hammers by installing absorption material. The operational changes are directed at reducing impulsive sound, while installation of sound absorptive pads on the hammers is intended to reduce the shop's other noise level. This plan, along with the other noise abatement measures taken over the preceeding ten years should provide relief to the nearby Class A lands. The plan as set out in the accompanying Order is incorporated into Subtitle H at Section 901.105(f)(1), and Amforge is, therefore, required to comply with it.

As for Docket B, the Board must conclude that short of totally enclosing the shops, Modern has already installed noise barriers to the furthest extent possible. Although these have

proven inefficient on windy or sunny days, they will hopefully provide the community some protection from impulsive noise, if only during days of no wind or sunshine, and during nighttime hours. At this time, Modern will not be required to make any specific physical changes to reduce impulsive noise, but is encouraged to continue replacing or locating new structures conducive to reducing noise levels. Lastly, Modern will be restricted to operating its forging hammers between the hours of 6:00 a.m. through midnight on weekdays, and 6:30 a.m. through 7:30 p.m. on Saturday, with no Sunday operations, pursuant to the plan adopted at Section 901.105(f)(2).

In the matter of Docket C, Wyman-Gordon proposes to move its operations to Building 75 at the northern perimeter of its facility. As mentioned above, the 74 Leq. reading was measured at three to four residences just north of Wyman-Gordon's facility. Enclosure of the Building 75's north side, the existence of the four buildings just north of it, and the doubling the size of the steel stock pile should minimize these incidents. Impact on southern residences should be reduced by Wyman-Gordon limiting operations in Buildings 6 and 7 to no more than 20% of its annual production. Finally, since Wyman-Gordon should routinely operate no more than one hour during nighttime hours as defined by Subtitle H, the probability of sleep being disrupted should be reduced. To insure these noise reductions and limitations, the plan proposed by Wyman-Gordon and found acceptable to the Board is adopted at Section 901.105(f)(3).

This Opinion supports the Board Order in this matter, adopted this same day.

I, Christian L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify that the above Opinion and Order was adopted on the 6th day of October, 1983 by a vote of 4-0.



Christian L. Moffett, Clerk
Illinois Pollution Control Board