# METHODS OF NOISE CONTROL IN THE FOUNDRY, PROBLEMS AND LIMITATIONS

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## ABSTRACT

Many available noise reduction approaches in foundries will not reduce noise levels below permissible exposure limits, but these approaches are still very worthwhile to take. A noise reduction of 5 dBA permits a doubling of the allowable time a worker can be exposed to the noise, and it reduces by 50% the possibility of an exposed worker losing his hearing. Three case histories of partial solutions are shown; in one of the three cases (arc furnace noise), a booth protecting the worker during the major part of the workshift was sufficient to bring the worker into compliance.

## INCENTIVES TO SOLVE NOISE PROBLEMS

Upon entering an operating foundry, one is confronted with all sorts of noises, particularly around a cleaning room where many different noise sources are operating at the same time. Noise control seems like an insurmountable problem, and indeed it is a very difficult one, but the difficulty of the problem is no reason not to attempt to solve it.

What are some of the incentives that make management feel that an engineering effort in this direction is cost effective? OSHA is now considering excessive noise as a serious violation, and fines in excess of $200 per violation are being levied. As the number of violations mount, so does the incentive. Of course, if nothing is done, and the violations become continued violations, then the fines apply on a daily basis. Such sanctions get management's attention.

Hearing loss due to excessive noise is beginning to be expensive. In Illinois, the maximum compensation for 100% hearing loss is $45,000. It doesn't take many claims of 100% hearing loss before there is some real money involved.

## EFFICACY OF PARTIAL SOLUTIONS

Not always is it necessary to solve a problem completely to realize a benefit. For example, if an operation in a foundry is producing 105 dBA of noise, and through some engineering procedures this noise level is lowered to 100 dBA, the benefit would be that 50% fewer exposed people would suffer a

hearing loss or that personnel could be legally exposed to the noise for two hours instead of only one hour without hearing protection. A 5 dB reduction is a substantial amount, and is very worth the effort particularly when many people are involved.

## METHODS OF NOISE CONTROL

Some examples of partial solutions to noise problems will be discussed with data indicating some of the results. I don't have as much data as I would like to have the opportunity to take. Once I have completed my initial surveys and made my recommendations, it is hard to get a client to pay for a return visit to measure the improvement. If any measurement is made it is usually by the client himself to show the improvement to OSHA. Usually when the consultant is brought in again, it is to document the results of his effort for OSHA litigation.

## CASE HISTORY 1 - CLEANING ROOM NOISE

A foundry had a problem with a cleaning room in which the castings were being chipped and shaped to meet certain dimensional specifications. As the castings were finished they were passed to the inspector for approval. Of course, if the casting did not meet the standards it was returned to the operator who then corrected the problem.

It was found that the area was in excess of 90 dBA for eight hours, and generally had a noise spectrum as shown in Figure 1. You will note that there is a heavy concentration of energy in the bands above 500 Hz.

Based upon this spectrum, and the method of chipping and inspecting, our decision was to protect those we could by engineering means, and to put hearing protection on the chipper-grinder operator. I know of no method to reduce noise of chipping. Metal against metal in a chipping operation is inherently noisy.

The approach to this partial solution was to construct a booth which had incorporated in it a work bench and a separation between the work area and the inspection area. This arrangement is shown in Figure 2.

What we accomplished was a reduction in noise for the inspector which was sufficient to put him in compliance on a time weighted basis. The noise reading was 87 dBA at the inspector's station during chipping, while in the booth it was between 96 and 99 dBA. This 9 to 10 dB reduction is about what can be expected with a partial barrier.

## CASE HISTORY 2 - ARC FURNACE NOISE

In a foundry producing steel castings melting was done with two direct electric-arc furnaces. They were cited for excessive noise in the furnace area and around the control console where the operators of the furnaces spent a lot of time. They were fortunate in that the only other people involved near the furnaces were ladle repair workers.

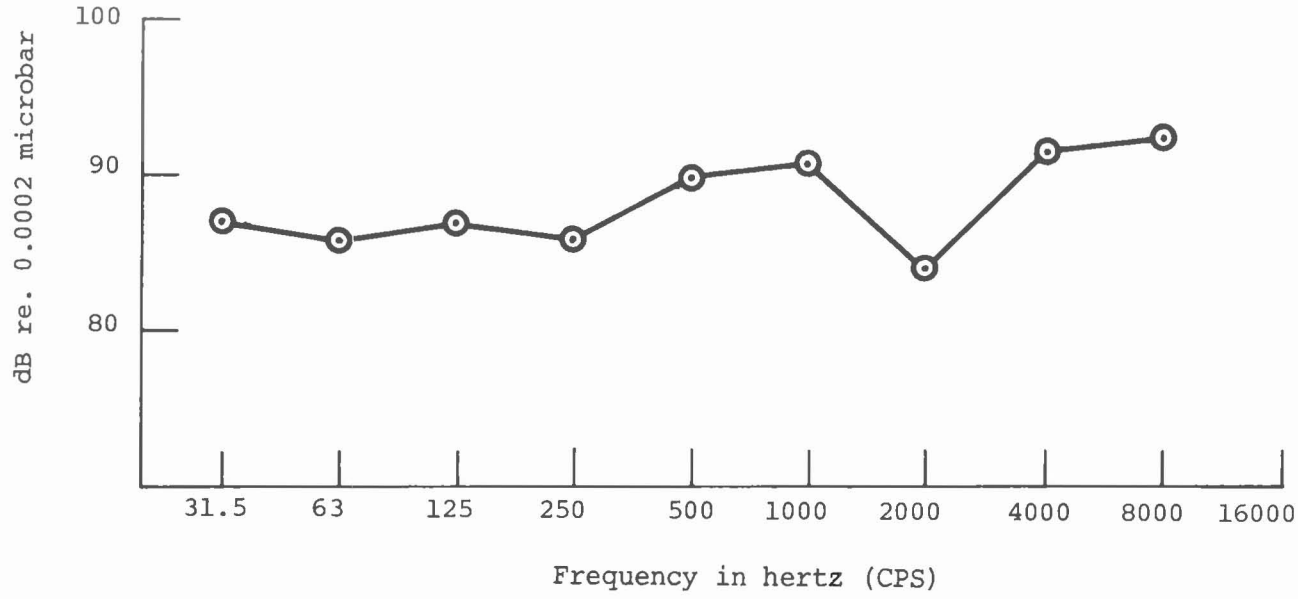



Figure 1. Noise spectrum at an uncontrolled casting chipping operation.

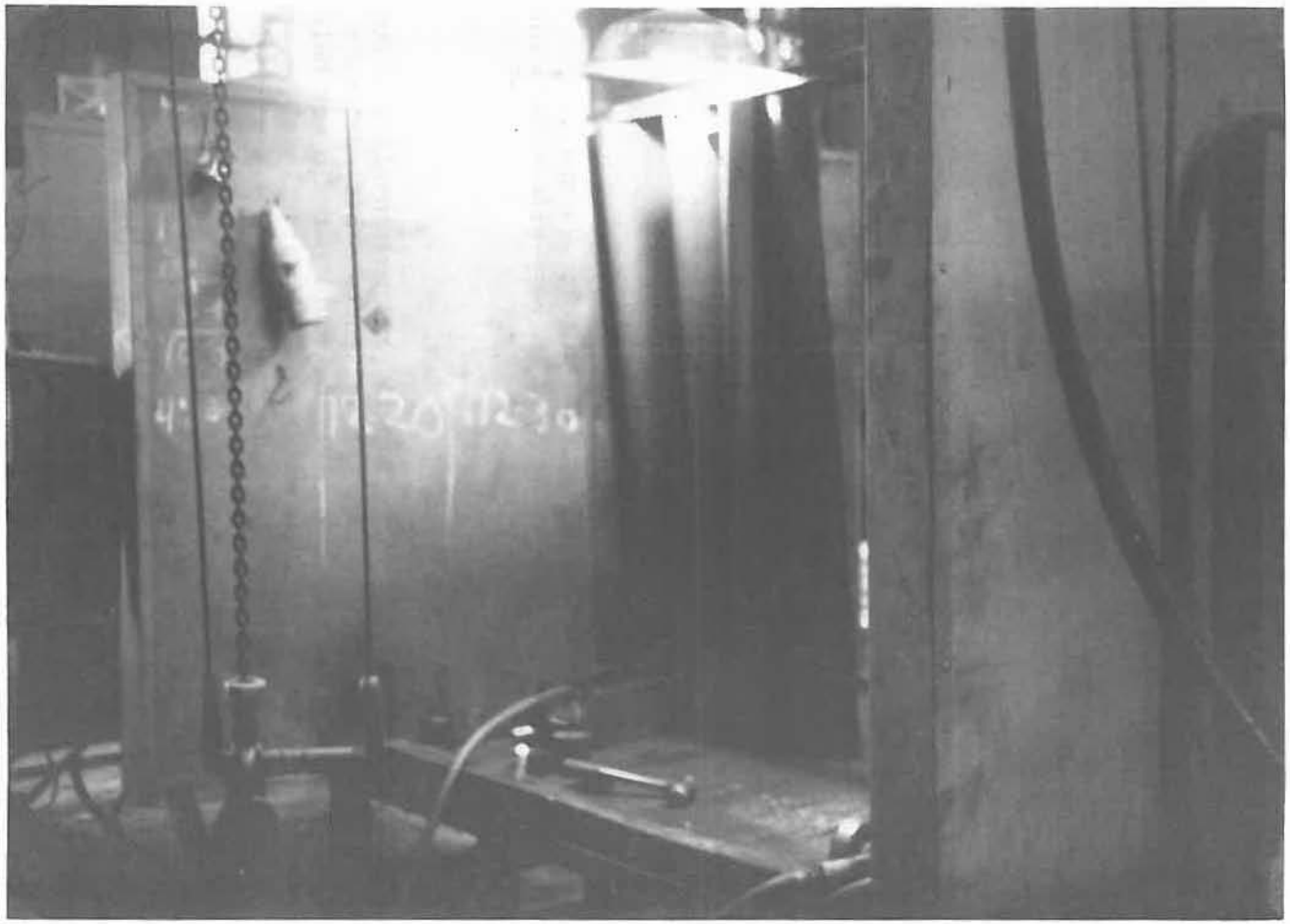


Figure 2. Cleaning booth with partial enclosure installed.

The type of noise spectrum found around the electric arc furnace is shown in Figure 3. You will note that during holding (idle condition) the noise level is about 94 dBA, with much of the noise in the middle frequencies (125, 250 and 500 Hz). At the start of a new heat the noise level increased to 100 dBA, and its spectrum shows increased energy in the 1 k, 2 k, and 4 kHz bands, which are the main bands affecting the dBA readings.

Trying to enclose two 15 megawatt furnaces with enough room inside the enclosure for the workers to move around and perform their job would have entailed the construction of a very large enclosure with complicated cooling and ventilation. It was decided to enclose the operators instead. This could be done with a much smaller and not nearly as complicated enclosure.

The ladle repair operation, which is separate from the furnace operation and did not need to be so close to it, was moved about 61m (200 ft) further from the furnaces which lowered the ambient noise level enough for this operation to be in compliance.

With the addition of worker booths in which the furnace operators spent all of their time when they were not working directly at the furnace, the resulting exposure on the furnace operators was under 90 dBA. The dust free environment reduced their fume exposure and improved the conditions under which their console operated, so that maintenance on the console was dramatically lowered. This represented a benefit in operating cost that partially off-set the cost of the enclosure.

The noise level in the enclosure during the idle, holding period was 67 dBA, and when a new heat was started the noise level rose to 74 dBA as levels reached 100 dBA outside the enclosure. This was a very effective solution to their noise problem.

CASE HISTORY 3 - SHAKEOUT NOISE

At the discharge of an automatic Osborne molding and pouring line a foundry had installed a partial enclosure around the shakeout. This enclosure was very effective for everyone working near the shakeout, but did not help the workers who were sorting the sprue and castings. The noise level on the aisle side of the enclosure was 88 dBA, while the sprue line personnel were exposed to 110 dBA.

It was felt that, even though hearing protection could be used, the noise level was high enough that excessive exposure was still possible even with ear plugs.

The layout of the line as it was originally constructed with the partial enclosure is shown in Figure 4. The enclosure was not small and had represented a sizeable investment, but produced disappointing results.

After reviewing the various options that were available, it was decided to change the layout of the line by moving the workers who were sorting from immediately adjacent to the shakeout to a new location which was further removed. It did not require a lot of additional space and they were able to

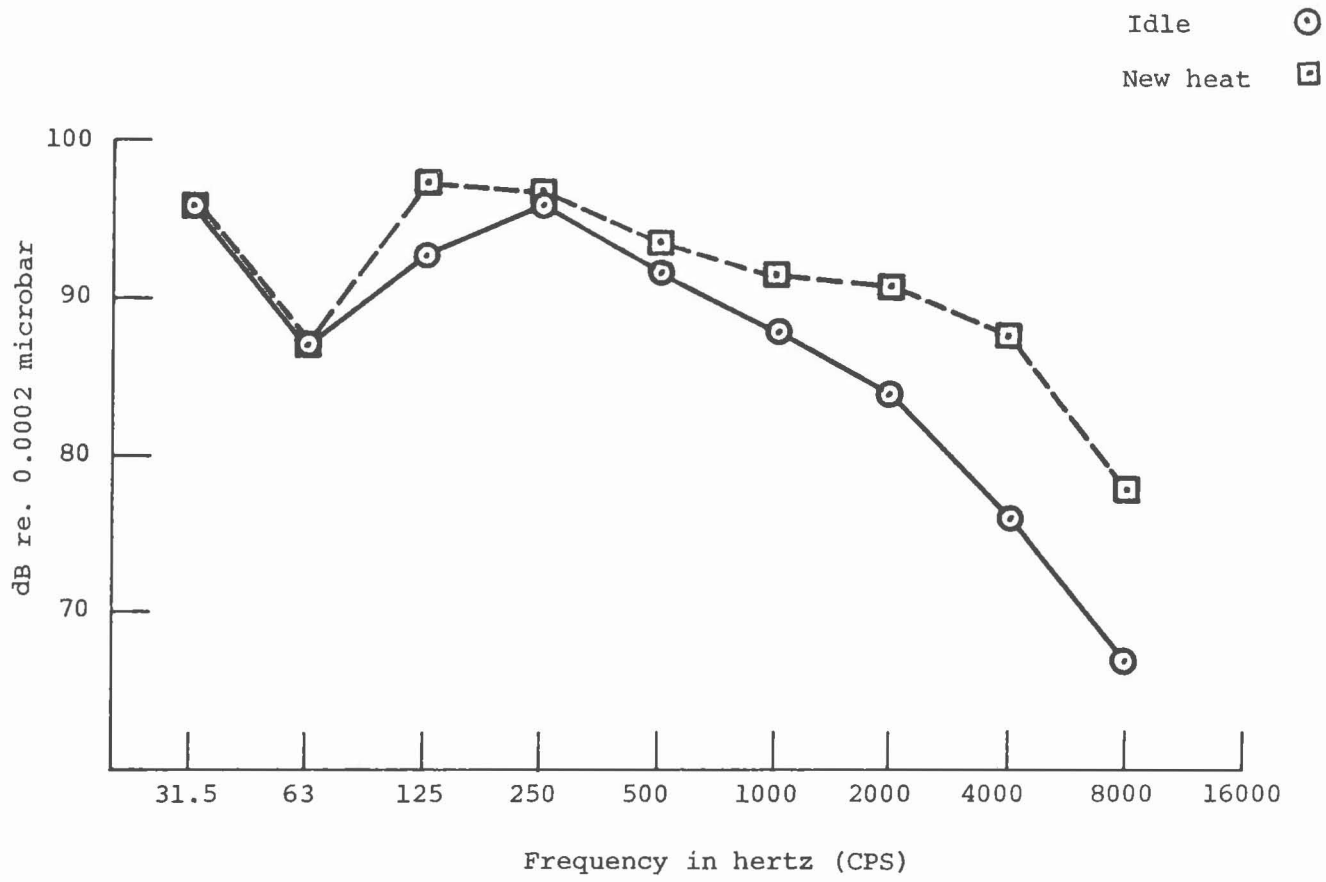
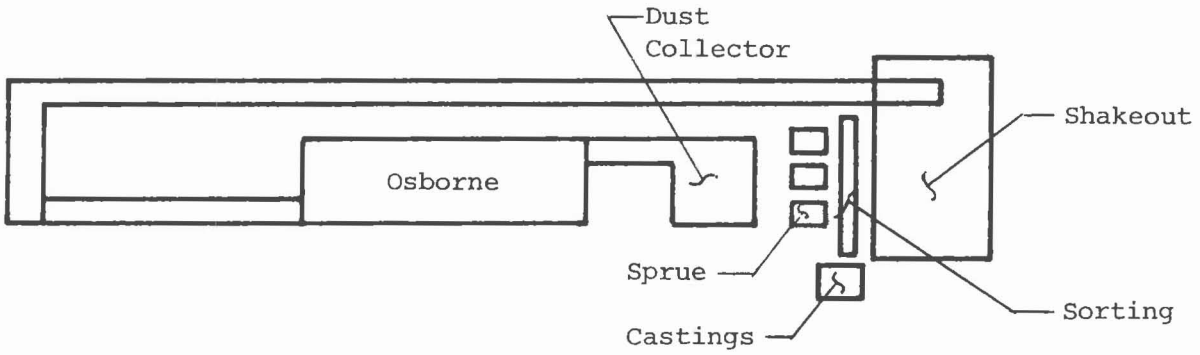
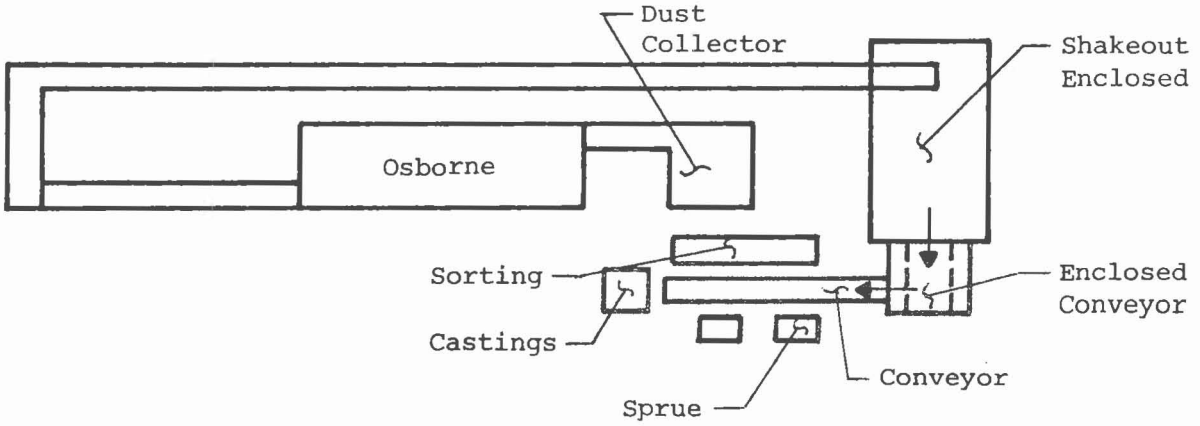



Figure 3. Noise spectrum near a direct arc furnace.




A. Three sided enclosure on shakeout




B. Enclosed shakeout

Figure 4. Isolation of shakeout noises from sorting workers.

make use of an area where the noise level could be less than right in front of the shakeout.

A fourth wall was added to the shakeout enclosure along with some necessary ventilation. Two new conveyors took the sprue and castings away from the enclosed shakeout and delivered the material to the sorting area. The use of the extra conveyors which carried the castings and sprue away from the shakeout made this arrangement successful.

## CONCLUSIONS

We have discussed some approaches to noise control in the foundry. These approaches did not necessarily solve the noise problem by reducing the noise below 90 dBA; what they did was to provide some noise reduction which improved the environment. A noise reduction of 5 dB permits a doubling the time a man can be exposed to the noise or it reduces the possibility of a man losing his hearing by 50%. Any such improvement is a worthwhile effort.

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