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NOISE CONTROL IN THE NEWSPAPER INDUSTRY - SOME BACKGROUND EXPERIENCE

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INTRODUCTION

Many noise consultants may not have a detailed knowledge of a given noise inducing process, nevertheless they may be required to produce noise control measures within a given budget. This is consistent with the authors' knowledge of the printing process. Such is the occupational hazard associated with noise consultancy, but the noise mechanism once understood has a set of basic principles which require to be applied. As in many processes noise in the printing industry is the by-product of unstable movement of a mass - if cyclic this movement is a vibration. Thus the detection and control of the forces causing vibration is basically the approach to the control of noise at source.

The aim of this paper is to provide an overview of the experience of our company, in the control of noise of Newspaper Printing Presses.

BACKGROUND

The process of sound generation in a printing press is a whole series of reactions and the removal of any one of them may not yield a significant profit in reduction of acoustic output. However, with the possible exception of the ink and paper sources, the noise control engineer has met them all before, albeit in a different guise. In general the noise problems associated with the printing press are the same as most processes which fall into three forms of activity - Mechanical Impact, Mechanical Vibration and Aerodynamic.

Each of the above primary sources can occur either singly or in combination to form a complex sound source.

In a printing press most of the noise emanates from cams, eccentrics and folding jaws, all of which operate at very high speed and manifest rapid accelerations and changes of motion.

By rule of thumb, the greater the mass or rate of change the smaller the time envelope in which such change occurs, the greater the energy is available. A reduction in velocity or mass of one magnitude could reduce the sound output by some 10 to 20 dB.

Conversley, retaining the magnitude of the force but imposing a lower limit on allowable deceleration levels effectively increases the time envelope over which the change occurs and can bring about similar results in reducing the acoustic output of a mechanical process.

Other than fans the classic aerodynamic source is not met in a press and the above has simply been introduced for completeness.

PRINTING NOISE

PRESS ROOM NOISE

Figure 1 shows typical levels of a recently surveyed press hall of a well known Newspaper. The results indicate a hearing risk problem especially for operatives working near the press machines. All press operatives experience doses in excess of 92 dBA monitored over a working day of eight hours. It is thus important to pursue some of the details highlighted by the levels in Figure 1.

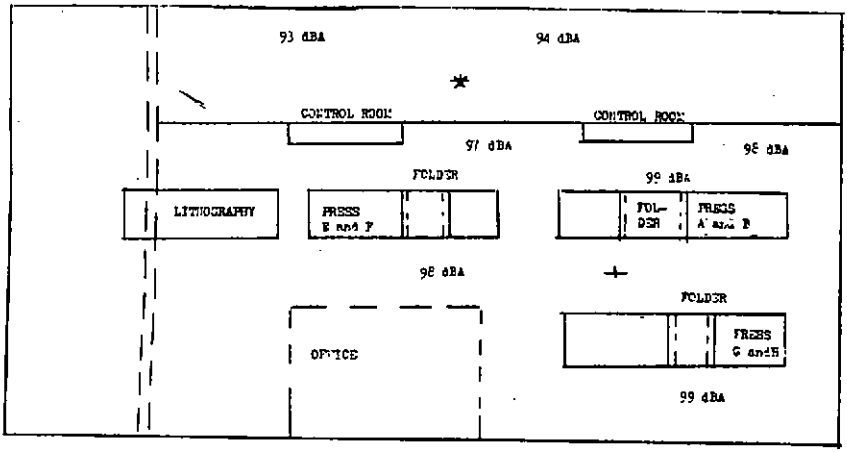


FIGURE 1

PERSONAL NOISE DOSE dBA L_{eq}

PRESS A/B	92.5
PRESS E/F	94.6
PRESS G/H	93.8

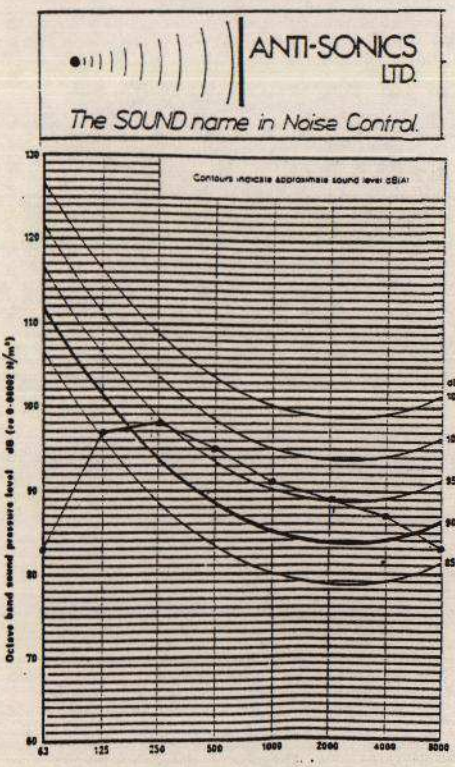
PRODUCTION 32 PAGES AT 33000 COPIES PER HOUR

TYPICAL PRESS HALL LAYOUT WITH ASSOCIATED NOISE LEVELS

Figure 2 shows a typical octave band set of levels of the press hall under no normal working conditions. The high level of low frequency noise centred at 250 Hz is typical of many press hall spectra. The spectrum was measured at a relatively quiet area given by point* in Figure 1 for the Press Hall.

A study of the noise variation for an increase in paper feed is given in Figure 3 measured at points + given in Figure 1. It is shown from this figure that at peak frequency approximately 2000 Hz increases by 16 dB for the doubling of paper feed is normal.

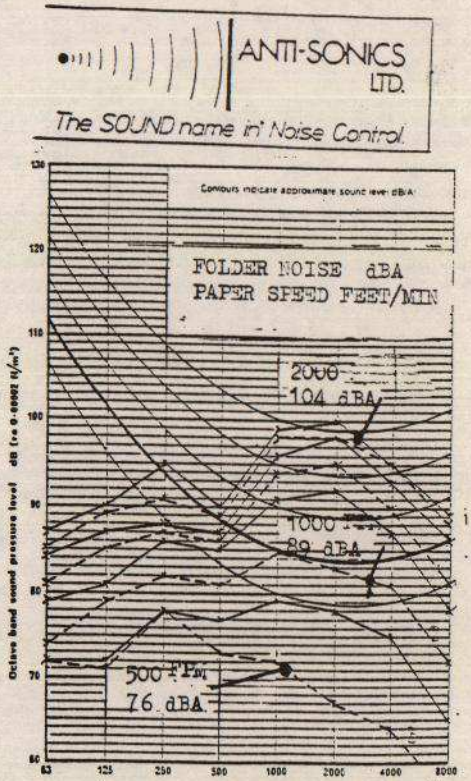
Thus one means of noise control is available - the lowering of production throughput for a relatively quiet area.



PRESS HALL TYTICAL SPECTRUM

33 000 COPIES PER HOUR

FIGURE 2



FOLDER NOISE-SPECTRA IN RELATION TO SPEED

FIGURE 3

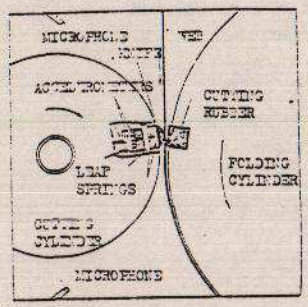
The power available in a modern printing press is high, not all of which is expended doing useful work. It should be noted that very little power is required to produce high noise levels. The printing press has two main sources of sound, that of inking the paper and the feed process itself.

The viscous ink film action

The viscous ink film acting intermediate to the roller and paper is under stress and, as the roller and paper move away from the contact point, the

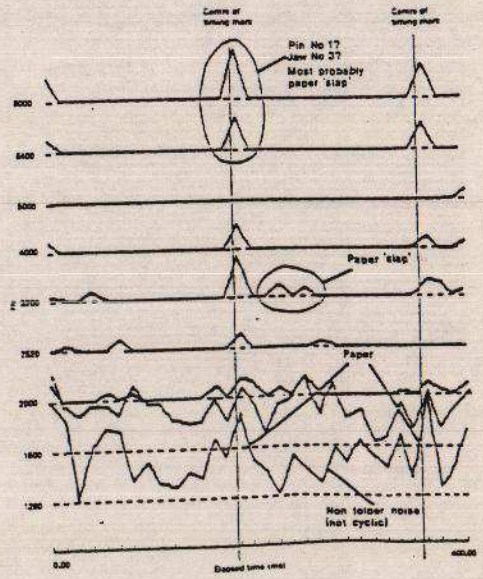
ink film tends to generate into stranded elements which stretch until the tension increases to a point at which they break and in doing so generate an impulse. As this is a continuous process with many of these impulses occuring simultaneously, the sound is heard as one tearing noise. It is however, difficult to establish the true magnitude of this source in the presence of so many others.

The progress of the paper through a press and between the rollers moving at high speed and under tension is subject to a cyclic excitation from the presence of a depression on the surface of the roller which retains the printing plate or print. This in itself produces a slight variation in the web tension, which manifests as a slapping sound. It has as its source later vibrations induced by periodic excitation of the web when, on each rotation, the depression in the roller forms a tangent to the web. Figure 4 shows the generation of the paper slap in the folder and Figure 5 the noise history of the folder measured at the blade and jaw. It has been shown that by shifting the vibrational energy to a frequency range where the radiation is less efficient cutting noise can be reduced by 15 dB.



GENERATION OF PAPER SLAP IN FOLDER

FIGURE 4



TIME/NOISE HISTORY OF FOLDER MEASURED AT BLADE AND JAW

FIGURE 5

PRINTING NOISE

The major sources within the press hall result from the printing unit and folder operation. It is interesting to note that the influence of the folder upon the overall noise level is some 4 to 10 dB higher than a press unit, and is entirely dependent upon the observation position. whilst the folder is an efficient producer of noise, the printing units themselves each generate noise levels very close to the folder maxima. Thus, as the distance from the folder increases its contribution becomes less influential on the final noise level.

The reel room has as its major noise sources, folder and printing unit noise breakthrough. Three distinct positionally dependent levels have been found. The first area is behind and underneath the press where the reel stands are located, the second is directly outside the press, where the reel preparation is commonly undertaken and the third is the area further away from the press between reel preparation and the wall. Figure 6 illustrates this situation graphically and also shows the effect of absorption.

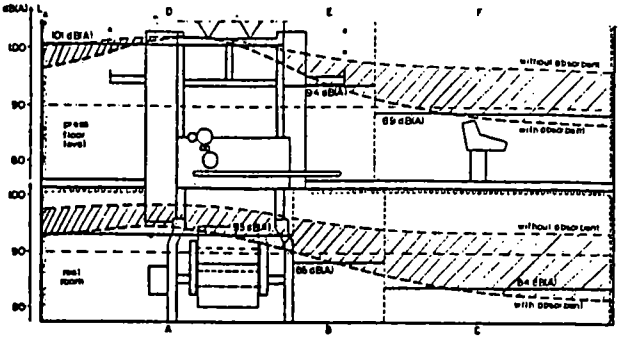


FIGURE 6

SUMMARY

Based on the case study outlined in this paper it is shown that the levels of noise in the printing industry are high. The control of the noise from the complex mechanism of a printing press requires diligent application of engineering techniques.

In the future it will be possible to produce a quieter press but the process will be evolutionary rather than revolutionary. It will not be a sequential extrapolation of contemporary practice, but will require redesign of the many mechanical processes.

Acknoledgement This paper is edited from a paper given by Mr J Charman the first author in a lecture to Printing Technology Personnel 1986. Thanks to the publishers for Figures 4 and 5. Silencing the Printing Press by J.E. Ffowcs Williams 1978.