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CONSIDERATIONS ON NOISE CONTROL AND ECONOMY

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COST-BENEFIT ANALYSIS

Since 1981 the Danish government has required cost-benefit analysis to to improve the basis for political decisions in the field of regulation of the working environment. The decision on lowering the noise limit from the existent level of 90 dB(A) to 85 dB(A) is among the first based on this procedure.

Costs. The analysis shows costs around 7.7 billion D.kr. - about 0.9 billion U.S. dollars. The costs could be reduced to 60 percent, 4,6 billion D.kr. if factories have 5 years planning horizon. This reduction is due to natural replacement of machinery and of rationalized production of noise control equipment.

The above figures are based on the assumption that the noise exposure is lowered to maximum 85 dB(A) for 96-97 percent of the workers today exposed over 85 dB(A). In practice this very high percentage of implementation could not be carried through during a few year.

It is estimated that a more realistic implementation of 75 percent will reduce the costs as much as to about 15 percent of the above costs. A further prolongation of the planning horizon by concentrating the efforts on new machinery will lower the costs furthermore.

Nevertheless, it has not been possible to avoid that the very high costs for the full implementation have dominated the public discussion in Denmark.

Benefits. The benefits from a reduction in the noise level to 85 dB(A) has been calculated on a percentage of implementation around 80 percent. Benefits account for at least 600 million D.kr. a year.
The benefits arise merely from a reduction in days lost through sickness and the reduction in the turnover of employees. It has not been possible to calculate the probably higher productivity.

It is worth noticing that the official costs for treatment and rehabilitation of noise injured persons are fairly small and calculated to around 50 million D.kr. a year. This amount is not assumed to describe the gravity of health effects.

It has unfortunately not been possible to calculate how many people are obliged to leave their jobs because of noise injuries.

Health effects. The most important health effects of lowering the limit for occupational noise exposure from 90 to 85 dB(A) are summarized:

- At a noise exposure of 90 dB(A), 10 percent of the employees will show a heavy hearing loss after 10 years, and after 30 years the percentage will be 18.
- At a noise exposure of 85 dB(A), 3 percent of the employees will show a heaving hearing loss after 10 years, and after 30 years the percentage will be 9.
- The risk of accidents goes up at increasing noise level.
- Noise exposure may cause circulatory disturbances.
- Noise exposure is a contributory cause of depressions, tiredness, etc.
- Reduced sence of hearing may deteriorate the social contact.
- Noise exposure may reduce the resistance of the person both physically and psychically.

In order to illustrate the extent of the noise injuries, we state below as follows:

- In 1979 approximately 129,000 (36 percent) industrial workers were exposed to noise levels over 85 dB(A).
- A Danish investigation shows that about 110,000 workers have a strongly reduced hearing capacity.
- Investigations prove that the noise problems are increasing during the years from 1970 - 1980.

DISCUSSION

At the present stage the cost-benefit technique should not be considered as an indiscriminate decision - making tool. The method has some basic weaknesses, which are not for the benefit of the working environment.

Health and quality of life. Benefits include improved quality of life and the above described health effects. It is not possible to quantify that kind of human progresses in economic terms.

Hard and soft data. Ashford (1) points out; that it is often assumed

that, because the costs on complying with regulation can be easily monetized, they are reliable estimates of true costs. Unfortunately, there are many instances in which the costs are not only uncertain but unreliable. Nevertheless, the experience is that the politicians and public rely on the "hard" data of costs, while the softer "number of the benefits" are harder to believe. The discussions in Denmark on lowering the noise level to 85 dB(A) have in full degree revealed this, and we fear that it will take several years before the noise level is reduced to 85 dB(A) through direct regulation in Denmark. The "hard data" on the cost side will be responsible for that.

Economic side - effects. Benefits also include positive economic side - effects, but they defy accurate forecasting. Any attempt to estimate this will lead to "soft data". An example from a related field - production of hearing aids - describe how demands on social welfare have started a positive economic development:

In the fifties a Danish law stated that people with hearing handicaps were entitled to have a free hearing aid. This resulted in the growth of a Danish hearing aid industri, which is still rather outstanding on the world market. The contribution of this industry is not negligible for the employment as well as for the Danish balance of payment.

Another example of positive economic side-effects is, that in the early seventies some large scale noise control projects were enforced in the bottling halls of the Danish breweries. Today Danish companies export as well know-how as hardware in the field of brewery noise control (2).

Our third example is the development of a new nail machine (3). For the purpose of lowering the occupational noise level in their factories, a company co-operated with the Technical University of Copenhagen. A remarkable new machine was designed. Besides lowering the noise level about 20 dB(A) the machine was a progress in several other respects. A company based on this innovation was started two years ago and has reached its economical break even last year (1982).

Those examples show that demands on increased social welfare often lead to build up knowledge. A few years later this know-how is the basis of an export to countries with ambitions of reaching a similar social standard. In connection with this kind of unique products, the price should not be the ruling competing factor. The profit rate should be large enough to finance further research and development. Consequently demands on social welfare have started a positive development.

Technological innovation. Related to the positive side-effects is the fact that cost-benefit analysis do not take three crucial issues into account (1)

(1) Economics of scale which inevitably arise in the demand induced

increase in the production of compliance technology:

(2) The ability of regulated industrial segment to learn, over time, to comply more cost-effectively - what the management scientists call the learning curve:

(3) Compliance costs based on present technological capabilities ignore the crucial role played by technological innovation, which yields benefit both to the related firm and to the public intended to be protected.

Indeed, environmental, health, and safety regulation has been called "technology-forcing" by the court and by analysts. The costs of compliance should not be based on static assumptions about the firm and its technology. Otherwise, a large overestimation will be the result.

In other words, the costs are calculated by multiplaying the price of a troublesome enclosure by the number of machines. In the case of nail production, this procedure leads to enormeous costs instead of a benefit - an income due to the fact that using the new machine is more profitable.

CONCLUSION

Applied as a rigid decision making tool cost-benefit analyses does not in itself lead to an improvement of the working environment. Used as a priority instrument, the cost-benefit analysis is much more useful. But as stated above, the "hard" cost data often lead to unbalanced discussion.

Cost-benefit analysis cannot substitute the social- and political attitudes in health and safety. Somebody has asked whether slavery had been abolished if based on cost-benefit analysis. We do not think so.

REFERENCES

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