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ACOUSTIC CONSULTANCY

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INTRODUCTION

The pioneer time in acoustics has passed, and acoustic consultancy is going to change its former character in more than one aspect. Let me start with a review, back to the fourties.

With a few exceptions, the interest in acoustics was very small at the universities until the sixties. Applied acoustics, and research, was mainly carried on for certain military purposes and then often as confidential work at special institutes.

When new techniques in building and mechanical industry caused serious acoustical problems, the technicians were not prepared to meet them. A few people from universities and from industry became the first acoustic consultants. Often under the press for time, they did fundamental applied research, and built the platform, from which almost all acoustic work today starts.

I will take the opportunity to give my honour to some of those whom I met during these days L.L. Beranek, R.H. Bolt, E. Meyer, E.J. Richards and L. Cremer, in the order I met them.

In this paper I will comment some experience from my 30 years in acoustic consultancy, that may give clues to its future roll.

BACKGROUND

Having a Masters degree in electrotechnics I got my first introduction to acoustics, working with sound insulating structures at the civil engineering department at Chalmers University of Technology in Gothenburg. For a very stimulating but too short time I was there

collaborating with the 1982 Rayleigh Medallist U. Ingard. I soon had to give lectures in Building Acoustics and Electro Acoustics.

When in 1957 I started a consulting firm on acoustics, jet noise problems became for some years a major part of the tasks. Jumps from one technical field to another, has been typical for acoustic consultancy. Today, when I have partly retired, the firm has 45 engineers employed and has dealed with about 10000 acoustic commissions in many various fields.

THE MAIN FIELDS

In Sweden where there has been regulations for sound insulation in almost all types of buildings since 1946, building acoustics always has been the basis for a continuous employment, though its relative part has varied widely. The main reason for this "faithfulness" being that sound insulation morely depends on how you use the material than on the material itself. The brick manufacturer can not manifest acoustical data the way a fan manufacturer can. A building project also is accompanied by other acoustical problems, noise from air conditioning, plumbing, elevators and so on.

Since the sixties as a rule - earlier just in special cases - street-, road- and aircraft-noise also must be regarded when building. A success in industrial noise control requires that the building constructions make vibration isolation of machinery possible and that they are designed to minimize flanking transmission. Except for flow noise I should say that fundamentals for sound insulation in buildings are applicable to most acoustical problems.

To the industrial field belongs external noise control and work environment.

In both these areas, and especially the last, the consulting work has expanded rapidly in the seventies. The present bad international economic situation seems however now to have put on the brakes. This is a pitty not so much for the consultants as for the great social demands, concerning physical and mental health. It is also here where the real large future noise control improvements are to be arrived at. This decade was expected to become the decade of "Noise Reduction at Source". Somehow that train seems to have run off the rails, so it really has to speed up when it comes on the trails again.

To exchange noisy machinery for quiet machinery must be the goal, but the quiet machinery must first be designed, which normally is a question of a decade or more.

Most noise control of machinery has ment enclosing. Large improvements are however to be achieved by partial redesign at a resonable cost. Sometimes this can be done in a short time, e.g. with small production stoppage, and the machinery can still be used for many years.

Partial redesign of machinery and other equipment will also give hints and directions for the total redesigning. Probably it will be the largest field for acoustic consultancy for many years.

Two circumstances may limit the extent. One is that the manufacturers will do the work themself to avoid leakage of factory secrets. Another is that their development departments take pride in solving their problems internally.

Despite the crisis in shipping, the demands on less noise and vibrations onboard ships can not be neglected.

Two fields which still have large unexplored areas are flow noise and room acoustics.

Most noise control work includes vibration insulation and so the acousticians must be competent in this subject. The knowledge can be utilized outside "noise control".

It can regard fatigue problems, where offshore installations, as oil drilling rigs, offer comprehensive problems. Another example is the foundation of vibration sensitive measuring equipment.

In general the acoustic consultant tries to and has to be broadbanded but there are also areas were a very hard, specializing is necessary, as for example in designing electroacoustical equipment.

THE FUNCTION OF THE CONSULTANT

Influenced by my collaboration with Ingard I based my still valid opinion, that the consultant should play an important roll as a link between academic knowledge and progress and applied technics. This roll, I think, will be still more important after the large advances in acoustics since the fifties.

Until now precise calculations in acoustic consultancy has been possible only to a relatively small extent. Basis have been missing or the customers have neither allowed the costs nor the time for it. The consultants have had to compensate for this by a skilled and systematic use of basic principles and to confirm his ideas by experiments and measurements. Inward personal qualities for this type of work varies of course very much with the individuals.

These conditions are now rapidly changing. It is however not so much due to broader theoretical basis as to the access of very fast and "intelligent" computers.

An often discussed question, mainly in machinery noise control, is: "Who should govern the acoustic work, the machinery specialist or the acoustician?"

In my opinion there is no general answer, it depends entirely on the individual qualities of the people involved.

In the fourties and fifties most acousticians had basically electrical background. Many fundamental phenomena were unknown, and developing measuring technics was a major part of the work. Today measuring is a minor part of the work and a sophisticated instrumentation is available on the market. Technicians from all type of branches are involved. A background in pure physics seems however to be the best, when the theoretical part is dominant.

Partly due to a certain conservatism and partly to blindness outside the own branch field, we found in the first years that we could function as a bridge to transfer known acoustical technics from one branch to another. For that reason we tried to let all our engineers circulate between varying types of commissions, regarding the acoustic knowledge being more important than branch knowledge.

The rapid evolution of acoustical technology, and with that more extensive tasks, makes this philosophy impossible to follow entirely today. For other reasons however the consultant must still have a solid knowledge in a broad field.

One reason is that the topics of interest varies. In many cases the consultants have been the first to tackle new problems, and have sometimes, for up to 10 years, been alone to work with them. When the technique has been developed, the branch people themselves take over. The consultant being superfluous, has to look for new tasks in other fields. Typical examples from Sweden are air condition plant noise, aircraft noise and road traffic noise.

Future systems and future vehicles will one day require reversals.

Another reason for the consulting firm to have a broadband knowledge is the normal complexity of a commission. Planning a new industrial plant includes in acoustics much to be regarded; noise due to increased traffic, external noise from the plant to residential areas, building acoustics including machinery foundations, machinery noise control a.s.o.

The current introduction of composites and other new materials will in several acoustic fields lead to new conditions and problems.

FURTHER TRAINING

A problem - not special for acoustic consultancy - is how to follow up the international progress and arrange for personal training. It can be divided into two parts. One regards information and communication. The other is mainly of economic nature.

After having put much effort in a "new" problem, including litterature search, you may by pure chance find, that it was solved twenty years ago. Much progress in acoustics is published in branch papers and difficult to find. Computer reference banks will partly reduce this risk for duplication of work. "Partly" because the commission may neither allow the cost of studying the references nor the time delay.

To arrange for good quality further training is economically a difficult task for the small firms. Training courses arranged by institutes are for that reason of great value. International conferences like INTER-NOISE are also important since they are giving a broad review of the advances and the level of the technology.

For further training it is of great value in the consultancy, partly to work in the research and development field.

WILL THE ACOUSTIC CONSULTANT'S BE SUPERFLUOUS?

The acoustic technology has made great achievements and the education in acoustics has been widely spread in the two last decades. Much of the work that the consultants used to perform, is today more or less standard and done by everybody.

Large manufacturers already has special acoustics departments and more to come. Others will have people partly engaged in acoustics. Specially in the later case but also in the first I think they should benefit from some more or less regular contact with a consultant, who can offer hints and new ideas.

Constructors and architects will still remain important consumers of the services of the acoustic consultants

For most industries and also authorities it will not pay to deal with their acoustic problems themself. The problems are mostly temporary. The demand on a more skilled work is rapidly increasing and a continuous contact with development is necessary.

If the consultants are alert I do not believe they will be out of work.

Maybe here will be a more distinct separation between two types of consultant as individuals. The first type should with a background of large experience promptly and economically solve most of the common daily problems. The other type should parallelly to special institutes deal with development and problems which to some extent require applied research.