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SOUND POWER - A MANUFACTURER'S PERSPECTIVE

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1. INTRODUCTION

AT&T GIS (Scotland) Ltd. designs and manufactures self service terminals for the world market, in Dundee these terminals are cash based and are known as ATM's (automatic teller machines) and in Dunfermline the products are non cash i.e. passbook terminals, interactive terminals. They all come under the heading of Information Technology Products (IT) and are referred to in acoustic standards as computing and business equipment products. The products are installed in banks (and other financial institutes), shopping centres, cinemas, warships, garages and airports, therefore their contribution to the overall sound levels within these environments will vary a great deal. The environment in which the product is used is changing and the trend in the workplace is to provide a more comfortable working environment and thereby improve customer/employee satisfaction. It is true to say that in recent years our customers have demanded reductions in the acoustic noise level of our products and as a result acoustics has taken on a new focus within AT&T GIS Ltd.

2. CUSTOMER VERSUS LEGISLATION

At present there is no legal requirement in any country that places actual limits on the acoustical noise levels of computer and business equipment products. However, there are laws or regulations in countries such as Germany, Denmark, Sweden and Norway placing limits on the overall noise levels in various types of workplaces. These regulations deal with hearing conservation and "Worker Comfort" and the specified limits placed on the employer (our customers) may place de-facto limits on the acoustic levels of AT&T products within a specified environment. Employers are encouraged to request and evaluate acoustical data from manufacturers before purchasing new equipment and in some countries incentives are given to the employers by the Government to minimise the acoustic levels within their working environment. In our experience customers have referenced the "Worker Comfort" legislation and quoted limits against our products, although we have never been deficient in complying with these limits it has been very clear that we have dissatisfied customers. In reality many customers have a number of manufacturers products within their work place and with reference to the overall limit applicable within that work place they identify the largest contributors and from this complaints are made. To avoid complaint our products must be quieter than our competitors products.

3. GERMAN REGULATION

Germany has a standard VDI 2058 which is titled "Assessment Of Noise In Connection With Workplace Requirements" and in this standard they reference the following:

"Section 15 of the Work Premises Regulations of 20th March 1975 (Federal German Gazette I, p.729) reads as follows:

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In work areas noise levels should be kept as low as possible, compatible with the nature of the business. Rating levels in workplaces and work areas may not exceed the following, including noise from external sources:

1. For predominantly mental activities, 55 dB (A).
2. For simple or mainly mechanised office activities and comparable activities, 70 dB (A).
3. For all other activities 85 dB (A), where this level cannot reasonably be maintained by operationally practicable methods of noise reduction, it may be exceeded by up to 5 dB.

In rest areas and for standby duties. in rest rooms and first aid centres the rating level may not exceed 55 dB (A). When establishing the rating level only noises of the industrial appliances in the area and noises from outside the area should be taken into account.

The sound pressure levels are measured at the workplace over an eight hour working day and compared with the sound levels given above."

This type of regulation appears in many countries under Safety or Work Premises Regulations and they have been used by a number of customers as a lever for reducing the acoustic noise output from our products.

4. AT&T APPROACH

Within each AT&T plant an engineer is identified and made responsible for the acoustic performance of the products, in most cases this person is not an acoustics expert (confession by the author) but assumes the responsibility along with other similar functions i.e. safety or EMC, in Dundee the author is seen as a centre for information and co-ordination of acoustic activities.

AT&T Scotland was formerly NCR (Manufacturing) Ltd and as NCR there existed corporate standards which were to be adhered to by all NCR design and manufacturing plants around the world. A corporate standard on acoustics defined various acoustic levels associated with typical working places such as hospitals, banks, factories etc. These levels were derived from data accumulated from such environments, the standards on acoustic noise were last revised in May 1985 and from that time demand for acoustic control has grown. What was considered acceptable noise levels in an office environment in 1985 is now not acceptable. While the AT&T corporate standards are being revised the current standards still apply, however the definitions and levels applied to various types of working environment i.e. library, office, factory are dated. Conditions within the work place have changed and these changes have had an impact on the perceived levels of noise from operating equipment placed within that environment. It has been accepted that with the changes we must continually improve the acoustic performance of our products to meet the new demands both from a legislative point of view and a customer satisfaction point of view. AT&T Scotland is still applying the corporate standards, however we have identified a limit within the standard which defines a sound power and sound pressure level suitable for library/hospital environments. This limit is 10 dB lower than the office/bank (our main customer environment) limit defined in the standard.

As well as the corporate standard document there is a design guidelines document titled "Acoustical Noise control". This is a reference document to be used by design engineers for both developing new products and for improving the acoustic performance of current product. All attempts are made at early design stage to avoid the pitfalls and design engineers are encouraged to use the limited in house facilities at Dundee. The facility within the Dundee plant has an Electromagnetic Compatibility (EMC) chamber which is designed for Radio Frequency (RF) testing but it also exhibits good acoustic performance. Throughout various stages of the

product development the chamber is used to do very simple comparative sound pressure measurements using an inexpensive hand held instrument. When the design team is confident that they have made all possible attempts, within the constraints of the design to reduce the acoustic noise level to a minimum then the services of a competent acoustic test facility are utilised. The production standard unit is assessed by the third party test service and data is provided which allows the design team to make further changes to improve the product if required and then to release the relevant information to the Marketing/Sales groups. The low noise levels of our products compared to the competition is used as a COMPETITIVE EDGE when dealing with potential customers, especially in Europe.

AT&T have used the services of NEL at East Kilbride, Scotland, previously opting for measurements in their acoustic chamber in accordance with ISO 779, but lately engineers from NEL have done on site testing at the Dundee plant using sound intensity techniques in accordance with ISO 9614 -1. The data provided to Marketing/Sales for use in brochures and presentations is a sound power figure in the idle mode and in the operating mode and a sound pressure figure in the operating mode at a typical bystander position which is defined by AT&T from its experience of the working environments identified for the product. The bystander position in today's typical working environment is the longest exposure position, it is normal to find our ATM products located beside a desk where an employee is engaged in "mental activities".

5. ISO 7779

Testing our products at NEL in East Kilbride in accordance with ISO 7779 provides us with good data, however there are a number of problems in using this service:

1. This standard requires the use of an anechoic chamber, therefore no on site testing is available.
2. The test time is long as a result of having to construct parallelepipeds and physically position microphones at a number of locations.
3. There is a significant cost in shipping product to and from East Kilbride.
4. Production standard units have to be booked well in advance and are required for upto 2 weeks..
5. The EMC/Acoustics engineer and a product technician are absent from the plant for upto 1 week.
6. Cost of accommodation and travel for AT&T personnel.

In practice to test one product at NEL using this method results in a considerable amount of planning, cost and inconvenience. The implementation of the EMC directive and the complexity of the supporting standards has demanded an increasing involvement in EMC testing and design for the author and therefore the time devoted to acoustic certification testing has to be minimised.

6. ISO 9614

Testing in accordance with ISO 9614: "Acoustics - Determination Of Sound Power Levels Of Noise Sources Using Sound Intensity - Measurement At Discrete Points" has resulted in a number of advantages for AT&T Scotland:

1. We can have Dundee and Dunfermline products tested on site without the need for special test conditions (no anechoic chamber necessary).
2. NEL provide the equipment and personnel to perform the testing.

3. A comprehensive test report is produced which presents a lot of additional information regarding specific sound sources within the product.
4. The cost per product is less expensive than the previously used method if more than one product is evaluated within the same test program.
5. Minimum disruption to EMC services provided by author and no need for additional full time personnel (technician).
6. Test takes less than a day per product after the initial set up. Last tests performed by NEL using this technique took two and a half days for three products.
7. Each product is only required for one day.

To date this testing can be organised at relatively short notice and involves minimum planning and disruption.

7. SUPPLIERS

The AT&T products use a number of modules produced by external suppliers and as part of our acoustic control program, modules which could contribute to the overall sound power level of our products are carefully specified. The supplier must ensure that the module meets with the sound power/pressure levels specified in the module procurement specification and he must supply evidence in the form of an acoustic test report and declaration. It is clear that manufacturers will have to meet the demands of their customers with respect to acoustic noise, for example in our business that means that manufacturers of the following modules (products) have to be actively involved in acoustic noise control if they are to retain AT&T as a customer and be competitive in the market place:

1. Power Supply Manufacturers
2. Monitor/CRT Manufacturers
3. Coin Dispenser Manufacturers
4. Electric Motor Manufacturers
5. Fan Manufacturers

8. SUMMARY

Working environments are changing and reducing pollution has become a high priority requirement around the world. Government legislation on the control of acoustic pollution is just around the corner for ALL products, however customers are already a step ahead as a result of pressures on them from other legislation and their customers.

If manufacturers fail to respond they will be unable to compete in the Market place.