

CASE STUDY

ASMET

Poland

Automotive

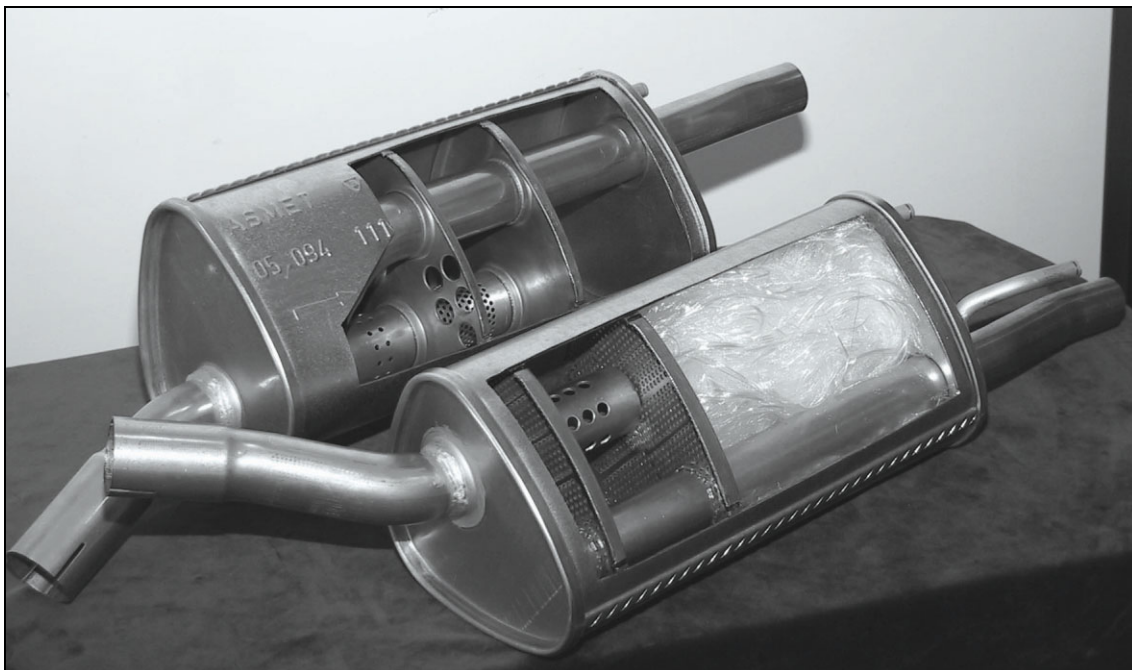
Acoustic Testing of Automotive Exhaust Systems

Analyzer, Microphones, Calibrator

ASMET was founded by Andrzej Szarski in 1989. Located in the Polish city of Czersk, some 250 km north-west of Warsaw, the company has grown rapidly from its origins as an automotive spare parts supplier to become a major European manufacturer of high quality automotive exhaust systems. ASMET has a production capacity of up to 250000 complete exhaust systems per year and remains privately owned.

The noise performance of its exhaust systems has always been a focus area for ASMET. In 1999, the company purchased a complete Brüel & Kjær solution to measure and analyse the acoustic parameters of its products.

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Fifteen Years of Growth – A Focus on Quality

With changes in its political structure, the late 1980s saw a boom in the importation of used cars into Poland. Spare parts from European manufacturers were expensive. To satisfy this growing demand, Andrzej Szarski founded ASMET in 1989.

The company's vision was established at its birth – to design, develop and manufacture automotive spare parts with quality, durability and performance that are equal or superior to the OEM equipment from automotive manufacturers. After a short time, ASMET decided to concentrate its focus 100% on the production of exhaust systems, and its success over the last 15 years is a testament to Andrzej Szarski's decision.

Exhaust System Production

Fig. 1

A part of ASMET's production facilities. At present, there are two halls providing 2700 m². A third production area will be added soon



ASMET's production facilities are impressive. There are currently two production halls which total some 2700 square metres. Due to the rapid expansion of its business, a third hall is to be added shortly to provide additional production capacity.

Fig. 2

To achieve its high product standards, ASMET has invested in state-of-the-art production equipment. This ensures high productivity and consistent quality



The product range is wide with exhaust systems for over 600 different models in current production. These comprise more than 1000 different components. All design and development is "in house", including the manufacture of production jigs. The flexible production lines enable both large and small batches of products to be easily and efficiently integrated together. About 250000 complete exhaust systems are produced each year and there are facilities to manufacture up to 25000 units per month at times of peak demand. ASMET employs nearly 90 people. The company is accredited to ISO 9001.

Fig. 3

Mirosław Bruski is ASMET's Managing Director. He has a Master's Degree in Engineering and joined the company in 2000



Mirosław Bruski is ASMET's Managing Director. He has a Master's Degree in Engineering and joined the company in 2000. Mirosław says, "Every month we add about ten new models to our product range, although there is still a demand for exhaust systems for older cars and we keep many in stock. Others can be produced on demand with short production runs from as few as 20 pieces".

He continues, "Every year we receive a report from the SAMAR company that monitors the automotive market in Poland. The report provides us with information on which new cars are sold each year, and those that increase or reduce. From these figures, we analyse the market and decide for which models we should manufacture exhaust systems."

Fig. 4

Currently, some 15% of ASMET's production is exported, and it is rising rapidly. This order is destined for Denmark

ASMET currently has about 20% of the market for replacement exhaust systems for cars and vans in Poland – more than any single competitor. Some 15% of the company's production is exported and ASMET is keen to expand this area of its business. For the last ten years, ASMET has exhibited at the automotive fair held annually in Poznan. In 2003, the company showed its products at Equip Auto in Paris and at Frankfurt in 2004. New EU rules require that replacement exhaust systems sold in Europe must be tested. Of ASMET's large production range, some 250 have been tested and a further 200 are in progress.



Original Equipment

Fig. 5

All production jigs are manufactured in-house. The illustration shows just some of the jigs needed to support ASMET's wide product range

But ASMET does not only supply exhaust systems for the aftermarket. One well known French-based automotive manufacturer with production and assembly facilities in Poland appointed ASMET as the manufacture of exhaust systems for two of its models. Miroslaw explains, "Although we are not always the cheapest, we won this important business because of our advanced technology compared to that used by our competitors, and our superior product quality. Our exhaust systems are the only Polish manufactured parts that are permitted to display the manufacturers logo".



Durability, Quality and Performance

Fig. 6

To improve acoustic performance, sound durability and heat resistance, many of ASMET's silencers use Advantex[®] Muffler Roving

During its 15 year history, ASMET has acquired great expertise in manufacturing exhaust systems. Miroslaw says, "Our policy is to purchase original equipment exhaust systems and to then thoroughly test and measure them before starting the design and development of our replacement. The common opinion from our customers is that our exhaust systems have a very precise shape and fit easily, and this saves the repair workshops a huge amount of time and trouble".

"Many vehicles now use catalysers to reduce emissions. We buy these components from a specialist manufacturer, add them to our complete exhaust systems, and sell the complete unit as a branded ASMET product. But it also works the opposite way and catalyser manufacturers often buy our components and then sell the complete unit as their own product."



To improve the durability, heat resistance, noise level and sound quality of its products, ASMET uses Owens Corning's Silentex[™] Muffler Filling System and glass fibre based Advantex[®] Muffler Roving. For some applications, polyethylene bags filled with continuous filament fibre glass wool are used.

R&D

Fig. 7
For quality reasons, all raw materials are imported. Steel tube comes from a major manufacturing plant in Germany

To design and develop an exhaust system, ASMET buys at least two complete units from the original equipment manufacturer. The units are carefully measured and CAD drawings produced. The aim is to achieve as close a shape to the original as possible.



The next step is that acoustic measurements are made in the anechoic room. The unit with the best noise parameters is cut to reveal its construction and the interior dimensions are again measured and CAD drawings made.

Prototypes of the new design are made and these are thoroughly tested, both for their physical dimensions but also their acoustic properties. Subject to these being within the specified limits, the new model is released for production.

Mirosław adds, “But we can also develop our own designs based upon our years of experience. For instance, with one well known and popular truck, we developed a new design of exhaust that gave a 6 dB (A-weighted) reduction in cabin noise”.

To ensure consistent overall product quality and durability, the steel sheet and tube used by ASMET is imported. Manufacturers in Germany are the main sources.

Acoustic Performance

Fig. 8
ASMET's goal is to manufacture complete exhaust systems with excellent durability and noise parameters that are equal, or superior to the original product. This is reflected in the company's marketing strategy

Mirosław says, “We have always regarded the acoustic performance of our products as a critical factor. Our goal is to make our exhaust systems highly durable but also quieter than the original component, and this is reflected strongly in our marketing policy. The measured spectra of our products must be equal or better than those of the original part. Exhaust noise is becoming an ever-increasing issue in Poland and the acoustic performance of our exhaust systems is a key market differentiator. We always aim for the best possible noise performance”.

Every three months, each model of exhaust system is taken from the production line and batch tested for dimensional accuracy and its acoustic parameters. If high volumes of a particular model are ordered, batch testing is made at more frequent intervals.

Mirosław continues, “Of course, many people, especially younger drivers, want their cars to sound right. So although we aim to manufacture exhaust systems with the lowest noise level, we also pay attention to the overall quality of the sound”.



“We have a simple philosophy – each and every customer must be 100% satisfied. We accept all complaints and offer a replacement exhaust without question. If the noise performance is the reason for a complaint, it is vitally important to fully investigate it, and compare the performance both to the OEM part and also other units taken from the production line.”

Acoustic Test System

“I first used Brüel & Kjær products when I worked as head of the environmental protection laboratory at a state-owned timber technology company. Brüel & Kjær has, in my opinion, always had a reputation as the world market leader in the field of noise and vibration. And when I joined ASMET in 2000, I was delighted to find that the owner, Andrzej Szarski, had invested in a complete Brüel & Kjær acoustic measurement and analysis system.”

In addition to being ASMET’s Managing Director, Mirosław is also the manager of its acoustic laboratory and is responsible for the methodology and testing of the company’s products. He is personally responsible for authorising new models for production. His decision is based on the prototypes passing the specified noise parameters.

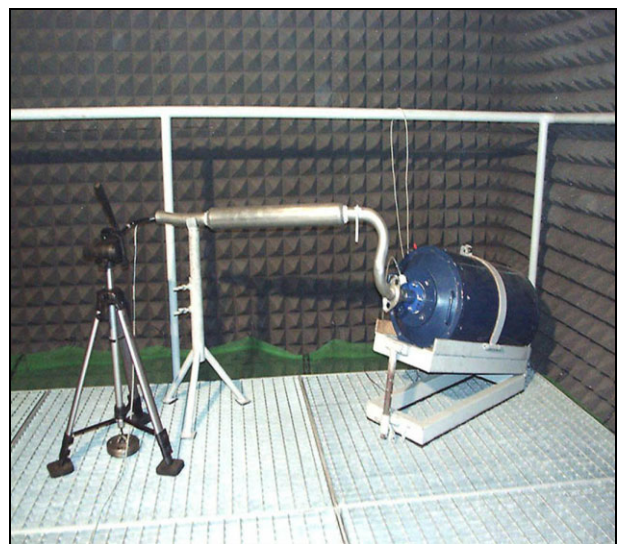
The complete Brüel & Kjær noise measurement system includes:

- Real-time Frequency Analyzer Type 2143
- Several 1/2" Microphones Types 4190 and 4192
- Sound Level Calibrator Type 4231
- Noise Generator Type 1405
- Power Amplifier Type 2706

ASMET designed and built its laboratory and anechoic room when the Brüel & Kjær system was commissioned in 1999.

Fig. 9

Left: Part of the test set up in the anechoic room. A Brüel & Kjær 1/2" Microphone Type 4192 is mounted on a tripod to measure the noise level from the outlet of the exhaust system
Right: The complete test setup. A loudspeaker in a special enclosure provides the noise source. The response is measured on a 1/2" Microphone Type 4192



Testing Methodology

Fig. 10

Analysis of the noise parameters of complete exhaust systems are made in ASMET's purpose-built laboratory. Test equipment currently includes Real-time Frequency Analyzer Type 2143, Power Amplifier Type 2706 and Noise Generator Type 1405. A PULSE system will soon be added

White noise produced by Noise Generator Type 1405 is amplified by Power Amplifier Type 2706 and applied to a loudspeaker contained in a specially developed enclosure. A sound pressure level of 128 dB is applied at the inlet of the exhaust system, where it would normally be connected to the engine manifold.

The noise at both the input and output is measured using two 1/2" microphones connected to Real-time Frequency Analyzer



Type 2143. The difference between the input and output levels enables the degree of attenuation to be calculated.

Measurements are made in the frequency range from 63 Hz to 5 kHz using 1/3-octave CPB analysis. Linear and A-weighted levels are also measured.

Using Sound Level Calibrator Type 4231, the microphones are calibrated at the start of every day when the noise measurement system is used. The Sound Level Calibrator Type 4231 is calibrated annually at Główny Urząd Miar (Central Office of Measures – a Polish metrological authority).

Although tests for R&D are made in the anechoic room, for troubleshooting, the exhaust system is installed on the relevant vehicle and the engine run at a predetermined steady state. Microphones are positioned at the input and output of the exhaust system and in the cabin. Measurements are also made at full throttle.

Data Handling and Reporting

Following an acoustic measurement, the raw data acquired by the analyzer is saved and permanently archived. Real-time Frequency Analyzer Type 2143 can store hundreds of spectra as measurement results. For each measurement two spectra are exported to Excel. A printed report is produced from the Excel file

A Successful Partnership

Fig. 11
Many of ASMET's exhaust systems use advanced construction methods to achieve excellent noise reduction characteristics



Owner of ASMET and President, Mr. Andrzej Szarski explains, “When I decided to invest in a complete noise measurement facility, we didn’t know much about noise. Our products either passed the relevant standard, or failed.”

“I based my decision to buy from Brüel & Kjær on a number of factors. Firstly, Brüel & Kjær was recommended to us by other users in the automotive industry and secondly, then, as now, the company had an excellent brand name and reputation. Price is never the first issue”.

“We are convinced that Brüel & Kjær is the best. Our measurement system is absolutely precise and gives us, and our customers, complete confidence. We think of Brüel & Kjær as our partners and friends. The service, support and back up from their office in Warsaw has been excellent. We are never left alone and they are always there to help – it’s not surprising that they have the reputation as the world leader in the field of sound and vibration and, in short, I am very pleased”.

Mr. Szarski continues, “As a result, we now know a great deal about the acoustic properties of our products, and this has affected our choice of materials, methodologies and production techniques. An example is the use of fibreglass-based roving rather than steel wool. Today, we have a high reputation for quiet exhaust systems, and we are in total control of the technology.”

The Future

Mirosław says, “At present, our noise measurement procedures use static tests. But our aim is to have, in addition, the facilities for making dynamic measurements where air is blown through the exhaust system to simulate the exhaust gas from the engine. We are also especially interested in noise source location using a sound intensity probe for measurements on vehicles, and the use of a laser technology”.

Mr. Andrzej Szarski concludes, “Our Brüel & Kjær system does exactly what we intended. It is totally reliable and has enabled us to ensure that the acoustic properties of our products are optimised. But just leaving the system alone is going backwards and we must ensure that we always use the latest state-of-the-art technology. The time has now come to upgrade our NVH solution to PULSE™”.

Key Facts

- ASMET was founded by Mr. Andrzej Szarski in 1989
- The company has become a major European manufacturer of high quality automotive exhaust systems
- ASMET has a production capacity of up to 250000 complete exhaust systems per year
- Flexible production lines enable both large and small batches of products to be easily and efficiently integrated together
- ASMET currently has about 20% of the Polish market for replacement exhaust systems
- Some 15% of ASMET's production is exported. This area of its business is expanding
- ASMET also supplies exhaust systems as original equipment to vehicle manufacturers
- ASMET uses fibreglass-based Advantex® Muffler Roving
- ASMET is accredited to ISO 9001
- Raw materials are imported. Steel tube and sheet comes from plants in Germany
- “We have always regarded the acoustic performance of our products as a critical factor”
- “Our goal is to make our exhaust systems highly durable but also quieter than the original component. The measured spectra of our products must be equal or better than those of the original part”
- “Exhaust noise is becoming an ever-increasing issue in Poland and the acoustic performance of our exhaust systems is a key market differentiator”
- ASMET designed and built its test laboratory and anechoic room when the Brüel & Kjær system was commissioned.
- A complete Brüel & Kjær noise measurement and analysis system was installed in 1999
- “Brüel & Kjær has, in my opinion, always had a reputation as the world market leader in the field of noise and vibration”
- “I based my decision to buy from Brüel & Kjær on a number of factors. Firstly, Brüel & Kjær was recommended to us by other users in the automotive industry and secondly, then, as now, the company had an excellent brand name and reputation”
- “Price is never the first issue”
- “Our measurement system is absolutely precise and gives us, and our customers, complete confidence”
- “We think of Brüel & Kjær as our partners and friends”
- “Brüel & Kjær has enabled us to optimise the acoustic properties of our products”
- “But just leaving the system alone is going backwards and we must ensure that we always use the latest state-of-the-art technology. The time has now come to upgrade our NVH solution to PULSE”

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