

AP Parts Torsmaskiner AB — supplier to the automotive industry

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For almost 50 years, this company has been producing components for the exhaust system for vehicle engines. The name and owners may have changed, but it has nonetheless always been clear that the company is based in Torsås, a town in an historical part of south-eastern Sweden.



It all began with the production of the pipe that connected the cast manifold and silencer on Volvo's post-war models. Compared with the complexity of current components, this was a very simple part. It was made of soft carbon steel and welding was performed using traditional gas welding. However, as welding technology developed, gas metal arc welding was introduced and the process was subsequently mechanised.

Cast manifold replaced with a welded version

Cost-cutting by vehicle manufacturers affected developments in every area. Interest eventually focused on the cast manifold in the engine. SAAB was one of the first customers to envisage a change and a far-sighted management team and skilled technicians at Torsmaskiner AB, as the company was known at the time,



Figure 1. Manifold for a 5-cylinder engine.

accepted the challenge and developed a manifold made of bent pipes which were welded to a joint connection flange. Welding immediately became an advanced part of the production process and robot welding was soon introduced. The welding fixtures were designed in house and the company's skills and expertise developed very rapidly.

When the new manifold was tested in the engine, an unexpected bonus was discovered. Engine output increased as a result of improved gas flow.

At the end of the 1980s, the welded manifold experienced a major breakthrough. SAAB decided to introduce it and Volvo quickly followed, incorporating the new manifold in its 850 model. Renault hesitated for a while, but eventually it, too, placed a large order. It then took only a few years for Volkswagen and Ford to follow suit.

Over the past three years, Torsmaskiner has invested a total of some SEK 170 million in extending production capacity to include new production lines to keep pace with large new contracts. The company now has a potential annual capacity of around two million manifolds on seven production lines, each of which is adapted to its individual model. The pipes are bent and shaped in fully-automatic pipe-bending machines. In 1999, more than one million manifolds were produced.

Higher temperatures require stainless material in the exhaust system

The exhaust temperature generated by modern engines is far higher than before and, as a result, the manifolds are now made from ferritic W1.4509 stainless steel with a chromium content of 17%. The scaling temperature is 950-975° C.

Hans Nyström, a welding engineer, explains that some joints are welded with OK Autrod 12.64, which is

classified as AWS A5.18:ER70 S-6, but that equivalent filler metal such as OK Autrod 16.81 in accordance with W1.4502 is frequently used, while other joints are welded with OK Autrod 19.82, SFA/AWS A5.14-89 ERNiCrMo-3 (see the data box for more information).

The robot welding stations are equipped with double welding pistols and wire-feed units to switch between different filler wires. It goes without saying that the changes take place automatically during the operating cycle. Short-pulse welding with 0.9 mm wire has virtually eliminated finishing, as the "spatter" is almost non-existent. Car owners have probably noticed that their exhaust systems last far longer nowadays, in spite of the higher exhaust temperatures. An improvement which can be attributed to the stainless material.

Very little transport is performed by warehouse trucks inside the production facility. Most of the parts and welded components are instead transported on conveyors, thereby making optimum use of floor space.

Quality inspections automated

Quality inspections take place at fully-automatic stations using software, in accordance with the standards stipulated in the contracts. Checks are made to ensure that the material is correct, that the welded joints are airtight and that the measurement tolerances have been complied with. A handling robot moves the components from one inspection station to the next. After labelling, the robot places the approved components on a conveyor belt, ready for delivery. Components that are not approved are put on a different conveyor and are taken back to be adjusted.

The company has developed a completely new manifold for the Volvo S80 Series with its five-cylinder engine. It consists of two halves of a sheet metal shell that are pressed together.



Figure 2. Manifold made up of bent tubes.

It goes without saying that product development takes place in close collaboration with the different car makers. The development, production system organisation and design of all the fixtures that are needed for production take place at the company's technical centre. Since the mid-1980s, AP Parts Torsmaskiner has had its own engine laboratory where it tests its products and conducts its own evaluations.

Catalytic converters — a new product in the range

At the end of the 1980s, the company entered the emission control sector. It is currently producing catalytic converters for all Volvo's five-cylinder engines in the S/V70 and S80 models. The assembly process has been completely robotised. Two catalytic converter inserts, one made of stainless material and one made of ceramic, are placed in one half of the casing. Before the ceramic insert, which is sensitive to bumps and vibrations, is fitted, it is covered with fibre material which ensures that it is firmly fixed inside the casing. The other half of the casing is then fitted and the two halves are welded together using gas metal arc welding, before the catalytic converter leaves the assembly station.

The two halves of the casing are compression moulded from thin stainless material. There is a rebate on each side to make room for the weld. When it came to the selection of the welding method, the choice fell on laser welding for a number of reasons. The heat that is generated is relatively limited and yet highly concentrated, which helps to ensure that no changes in shape occur. The laser beam provides excellent access to the catalytic converter connections and the welding speed is high. Hans Nyström explains that the Institute of

Technology in Luleå has been a great help in developing the laser welding method to suit the company's products.

Torsmaskiner is now part of a global car component producer

At the beginning of this article, mention was made of various changes of ownership. Originally, the company was owned by the family that founded it. It has expanded powerfully under the guidance of target-oriented leaders and technicians, who have developed its products and adapted the company to comply with the increasingly demanding customer call for improved products at lower prices. Continuous production rationalisation at every level has cut costs, while maintaining or enhancing the level of quality.

AP Parts Torsmaskiner AB with its 550 employees is currently part of the French Faurecia Group, a global car component manufacturer, with a total of 32,500 em-

About the author

Mats Persson has been engaged in welding for 50 years. During the first 25 years in service and sales of resistance welding machines with ASEASVETS and ESAB. 1975–77 he was technical manager at ESAB Australia. Thereafter area sales manager and later technical manager at ESAB International.

Welding consumables

The filler wire has been chosen to take account of the material that is being welded and the environment in which the weld is going to be used. The following table presents four different types of wire, ranging from a simple carbon-steel wire with a slightly increased manganese content to a high-alloy nickel-chrome-molybdenum wire.

Classification	ESAB designation	Alloy type
AWS A5.18ER 70 S-6	OK Autrod 12.64	Mn/Si alloyed
AWS A5.9ER 308 L Si	OK Autrod 16.12	18%Cr 8%Ni 0.5%Mo, low C
DIN 8556 SGX8 CrTi18	OK Autrod 16.81	18%Cr-0.5%Ti
SFA/AWS A5.14-89 ERNiCrMo-3	OK Autrod 19.82	Min.60% Ni, 22% Cr,9% Mo, 3.5% Nb (austenite)

OK Autrod 12.64, 0.9 mm in 250-kg Marathon Pac is used at several welding stations.