

Compressed air – ensuring safety in motor cars



The 2nd shift is coming to an end. It is already past 10 PM. The team leader is on his way to the gates. "Everything ran smoothly today, no production losses, we performed very well again", he said to his colleague at the entrance and wished him goodnight.

In the following article we want to explain to our interested readers the steps that are being taken behind the gates of the Robert Bosch automobile supplier's factories in Blaichach and Immenstadt in regards to safety, precision and reliability and how BAUER KOMPRESSOREN'S custom-made compressed air units guarantee an optimal supply and maximum economic viability.

The Blaichach-Immenstadt Bosch factories, also called Bosch in the following, are in the area of Seifen in Immenstadt and were built in 1986. There are approx. 2000 people working in a fenced off area of more than 100.000 square meters. The anti blocking system (ABS) and the electronic stability programme (ESP) are produced here observing the aspects of economics and high-quality parts manufacturing. Furthermore, apart from the traditional ignition coils with bitumen or oil filling, they also produce ignition coils with epoxy resin isolation for the motor-control.

The compressed air, testing medium for the ABS components' performance and impermeability test is delivered

by BAUER KOMPRESSOREN, the specialist in the high pressure sector. ■

Safety on our roads

Nowadays every driver knows how important the ABS anti blocking system has become on our overfilled roads. The locking of wheels impairs both road performance and steering of a vehicle and in most cases, increases the braking distance. This controlling system avoids the wheels locking up when breaking and therefore enables you to continue steering the vehicle.

Also the newly developed control system for the dynamics of vehicle movement ESP (electronic stability program) includes all the well know

functions of ABS and ASR (automatic slip control) and also guarantees high quality road performance in our motor cars. ■

From the hydraulic testing medium to high-pressure air

At first the ABS systems produced in series were tested with brake fluid, which was not such a good system to handle since the parts are evacuated by the automobile manufacturer to fill the brake system, the test brake fluid had to be blown out again in a time-consuming cleaning procedure. The search for a better and more economical alternative to brake fluid began.

It was at this point that air was chosen as a testing medium; it can be

compressed to the needed working pressure with a 3 or 4 stage air-cooled piston compressor. ■

Testing medium and housing to test have to fulfil the highest standards.

After the decision was made to use compressed air as the testing medium, then the quality of the air had to be defined.

The operating technicians make the following requirements to the quality of the compressed air:

Purity of the processed air:
pressure dew point -20 °C

Oil residuals of the processed air:
< 0,1 mg/m³ free air

Two pressure ranges are set for the specific ABS components' performance and impermeability test; a medium pressure and a high pressure range.

As noted at the beginning, Bosch gives high priority to precision, safety and reliability regarding manufacturing. That is why they carry out an impermeability and performance test under pressure on each valve body. The parts to be tested are transported to the testing station via a clock-controlled conveyor belt and are coupled and

uncoupled automatically. If the set pressure drop is exceeded by only a few millibar, the part is automatically rejected. Since the demand for safety parts of such quality is still very high in the automobile industry both at home and abroad, they are able to test a total of approx. 28 000 parts per day in this way during a production of 3 shifts. ■

Selecting the compressed air station

After having defined the quality features for the compressed air, BAUER KOMPRESSOREN GmbH, a worldwide known manufacturer of piston compressors and specialist in the high pressure sector was given the technical design of the project and was then awarded the contract to deliver, install and put the units into operation. A task that the specialists in the high pressure sector deal with day in and day out.

As mentioned previously, 2 different pressure ranges were determined. To cover these pressure ranges, we use 2 of each of the air-cooled and oil-lubricated 3 and 4 stage piston compressors with equal equipment from the proven BAUER series:

Medium pressure model B 12.4-4 and high pressure model I 28.0-55 with delivery quantities of respec-

tively 230 l/min and 2500 l/min. Both models are equipped with a fully automatic BAUER-COMP-TRONIC monitoring system, which monitors the units independently and in the case of malfunctioning, switches them off automatically and simultaneously signals the fault to the SP control with the higher priority.

To keep the noise emission as low as possible, they use compressors with sound insulation. The smaller unit has a sound pressure level of 72 dB(A), the larger machine one of 76 dB(A), measured at 1 m distance according to DIN 45635, part 1.

The air is dried with a cold regenerated adsorption dryer with an activated carbon adsorber further along to remove the oil from the air. The medium pressure range is taken over by the Zander company's HDK/HDA 140-100 model. The high pressure is covered by the BAUER model Seccant with Seccotronic control system, proven and reliable for industrial use.

Since there isn't an air-conditioned room available to install the compressor in, the units have to be put in the upper floor of the factory halls where during the summer the temperature level is between 28 and 37 °C. Under such temperature conditions, in order to still achieve



HP-compressor modell I 28.0-55 ■



HP-compressor with Seccant IVA dryer activated carbon adsorber, heat exchanger and online dew point hygrometer ■



MP-compressor modell B12.4-4 with regeneration dryer, activated carbon adsorber and heat exchanger ■

optimum drying and oil drainage in the adsorber, the compressed air has to be cooled down via a water/air-heat exchanger to an acceptable operating temperature of approx. 25 °C before it enters the adsorption dryer.

For the medium pressure range Kemmerling's FKV 76.0811 HD 70 model is used and GFT's SKS 133/033 HP version. The cooling water flow is monitored by a flow control instrument, which switches off the unit when the cooling water supply from the cooling tower is blocked.

To make sure the humidity of the compressed air always stays constant, a dew point measuring device, built in the pressure tube after the dryer monitors continuously the quality the air has reached. If it differs from the set value, the compressor unit is shut-off immediately and the stand-by unit automatically starts up.

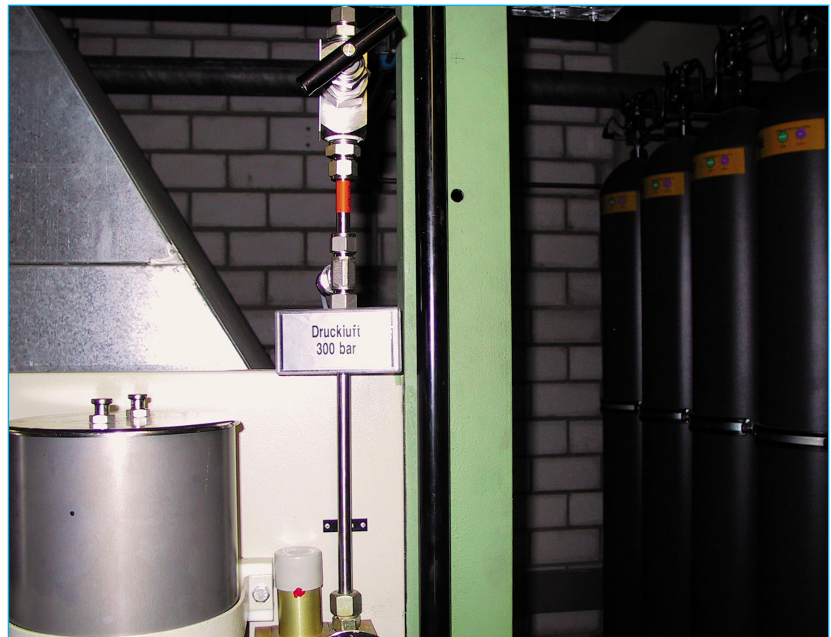
At the same time the malfunction is signalled to the central control unit with the higher priority and from there the service mechanic on duty is immediately informed about the breakdown. ■

Storing the compressed air

Since in general the high-pressure compressor unit should not switch off more than 4 to 5 times an hour and the standard air consumption for each test sample is minimal, the compressed air has to be placed in intermediate storage. This is done in the vertical version of stationary 50 l bottles.

A total of 12x50 l storage bottles are used.

The compressed air has to cover long distances between the compressor room and the test benches. That is why the storage bottles have to be split into 2 groups, in other words after the high pressure



Storage system ■

compressor there are 8x 50 l and about 300 m further along the line another 4x 50 l bottles are placed. In this way the needed storage pressure is specifically available in the bottles. The testing pressure at the testing stations is set by pressure reducers that are installed near the test benches.

The high pressure lines are made in stainless steel, material no. 1.4541. The high pressure tubes are connected with Swagelok screw fittings. To make sure the pressure drop in the HP-tubes does not exceed 0,1 bar and because of the very long tubes leading through the factory hall, it is imperative that the cross section of the tubes have the exact dimensions.

On the total of 1000 m of pipeline these dimensions are 16x2 mm and 12x2 mm from the small storage group (4x50 l) onwards.

The special versions of the two B 12.4-4 medium pressure units supply the vertical version of 2x1000 l storage bottles and deliver dry and practically oil-free testing air, which is then sufficiently available at the testing stations approx. 100 m away. All units run continuously in 3 shifts around the clock. ■

Target reached

By introducing compressed air as the testing medium used for the pressure and performance test of the test pieces it has proven that in particular cases not only is it the better process technology compared to oil-hydraulics, but it also has an economic advantage for the company. With their project design and the advantage of their long term professional experience in the high pressure sector, BAUER KOMPRESSOREN was able to make a considerable contribution towards this success. ■

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