CASE STUDY

novus®

Steel constructions for the world – welded in a clean atmosphere

Multiple NOVUS Airtower units in use at Schachtbau Nordhausen Stahlbau GmbH

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The SCHACHTBAU Group, based in Nordhausen, in the German region of Thuringia, looks back on a long tradition. The company has operated for over 110 years in the fields of mining, mechanical engineering, steel-girder construction, plant engineering and construction. It has developed from a supplier of specialist mining technologies to a globally operating company which today employs more than 900 staff and runs several branches.

The story of the company's success began in 1898 with the development and construction of the first "System Gebhardt" large-scale freezing unit. Solutions for the field of mining, such as drilling heads for the "multiple drift" method of tunnel construction, made SCHACHTBAU NORDHAUSEN GmbH a leading supplier in the sector.

However, as this branch of industry declined in importance from the early 1990s, the company (owned by the Bauer Group since 1992) moved into new areas. The mechanical engineering and steel-girder construction divisions have been constantly expanded. Here, business activities focus on the construction of road and railway bridges, dams, sewage treatment plants and halls. The company has now successfully completed more than 200 projects building and maintaining structures in the field of road and rail traffic, such as pre-stressed concrete bridges, steel bridges or composite bridges.

Currently, a 120-metre network arch bridge is being built near the North Cape (Figure 1). From September 2017 onwards, this bridge weighing a total of just under 600 tonnes will link Norway to Russia via the Bøkfjord.

Thousands of tonnes of steel are processed every year in Nordhausen, including not only the standard S235 to S460 steels, but also S690, S960 and CrNi steels. As welding is the main joining process used, the company is DQS-certified in line with DIN EN ISO 3834-2 on integrating welding requirements into the general management system, and also has a certified occupational health and safety management system in accordance with OHSAS 18001: 2007. It welds sheets up to 200mm thick.

Every day, 60 welders and ten welding engineers work simultaneously on different projects, always putting the welding quality first. All weld lines must pass X-ray and ultrasound testing, since they have to withstand what are often extremely high loads for several decades. The logs and documentation on the work carried out and test results are sometimes kept for up to 50 years. Accordingly, every welder has to deliver high-quality work – with weld beads of several hundred metres, using the standard MIG, MAG and GTAW welding procedures.

Main section of the arch bridge for a traffic project on the North Cape – this will fill a 120m gap

The work takes place in large halls up to 100 x 25 metres in size. To process the components in an optimal manner, they are brought into appropriate positions to ensure that workers have barrier-free access and can work in an ideal position. To this end, large steel constructions are, for example, turned using a crane. With this large number of processes, of course, large amounts of welding fumes are produced, which are well known to be extremely detrimental to workers' health.

Until recently, a fixed pipe extraction system was installed beneath the hall ceiling. However, after 25 years, this was no longer in line with the state of the art, and regulatory requirements on pollutant limits could no longer be complied with. While, in the past, extraction systems were used over large areas – but were not very effective – today, modern air cleaning solutions are used. Retrofitting the existing ventilation systems would have made no sense in terms either of money or ventilation technology. Following the introduction of the new general threshold limit value of 1.25 mg/m^3 for biopersistent granular dusts, respirable fraction (in the Technical Rules for Hazardous Substances, TRGS), a solution needed to be found to clean polluted air effectively. Though the welders are supplied with fresh air, the hall was extremely stuffy, especially in the summer. In addition to this, all the workers carrying out work indirectly related to the welding in the hall (supplying material, supervising, planning etc.) were directly subjected to the welding fumes.

Using filter towers was regarded as the ideal solution. For this purpose, six different providers were contacted, three of whom were evaluated more closely. During the eighteen-month selection process, it was clear that "we wanted a flexible, self-sufficient, holistic solution", explains Frank Malchau, production manager at SCHACHTBAU NORDHAUSEN Stahlbau GmbH.

"Our calculations showed that investing in filter towers was several times cheaper than retrofitting the old hall and the old system."

Today, the company runs a total of six NOVUS Airtowers. The system selection process determined that this was the most efficient of all the filter tower solutions. On the one hand, they generate the lowest cost per cubic metre of purified air. The energy efficiency package selected ensures that the towers only turn on when the dust concentration exceeds a certain limit. To do so, a pollutant sensor measures the emissions, and the extraction units power up or down automatically. On the other hand, the filter towers provide a high degree of flexibility. They can be installed at different locations in the production hall, depending on the focus and necessity.

The NOVUS Airtower operates according to the layer ventilation principle, which is considered an ideal method of air circulation and is actually recommended by the trade association.

This involves polluted, warm air being extracted down from a height, while undergoing cleaning. With a filtration rate of more than 99.6%, the system not only ensures that the air is extremely clean; upon its return to the working area, the air is also used to heat the production halls. "We no longer need to use our heating in the winter", Frank Malchau explains.

The ideal spot in which to install the towers was determined in cooperation with Novus. To position the Airtowers, it was not necessary to inspect the building structure closely; all that was required was to examine the precise work processes carried out in the working area. "In this way, we not only determine the number and size of the units required, but also give our customers a recommendation on where to position them. The aim is always to constantly undershoot the new thresholds", explains Jani Mäkelä, Managing Director of Novus air GmbH. Taking into account the work processes and material flows, the ideal positioning was determined in cooperation and consultation with the production planning team at SCHACHTBAU NORDHAUSEN.

"Our staff's health is very important to us", comments Frank Malchau, concluding: "Since the filter towers were put into operation, the sick rate has dropped noticeably." Last but not least, the NOVUS Airtower's plastic housing is regarded as an advantage. "It is sometimes the case that things knock up against the towers when materials or components are being transported through the hall. But thanks to their flexible housing, they don't suffer any serious damage, so they don't need to be repaired", Frank Malchau smiles.

All in all, there are no complaints at SCHACHTBAU NORDHAUSEN about the extraction and filtration systems. They meet all the requirements behind the selection of the air cleaning systems. Frank Malchau explains:

"The investment was absolutely worth it. We're very satisfied – without reservation."

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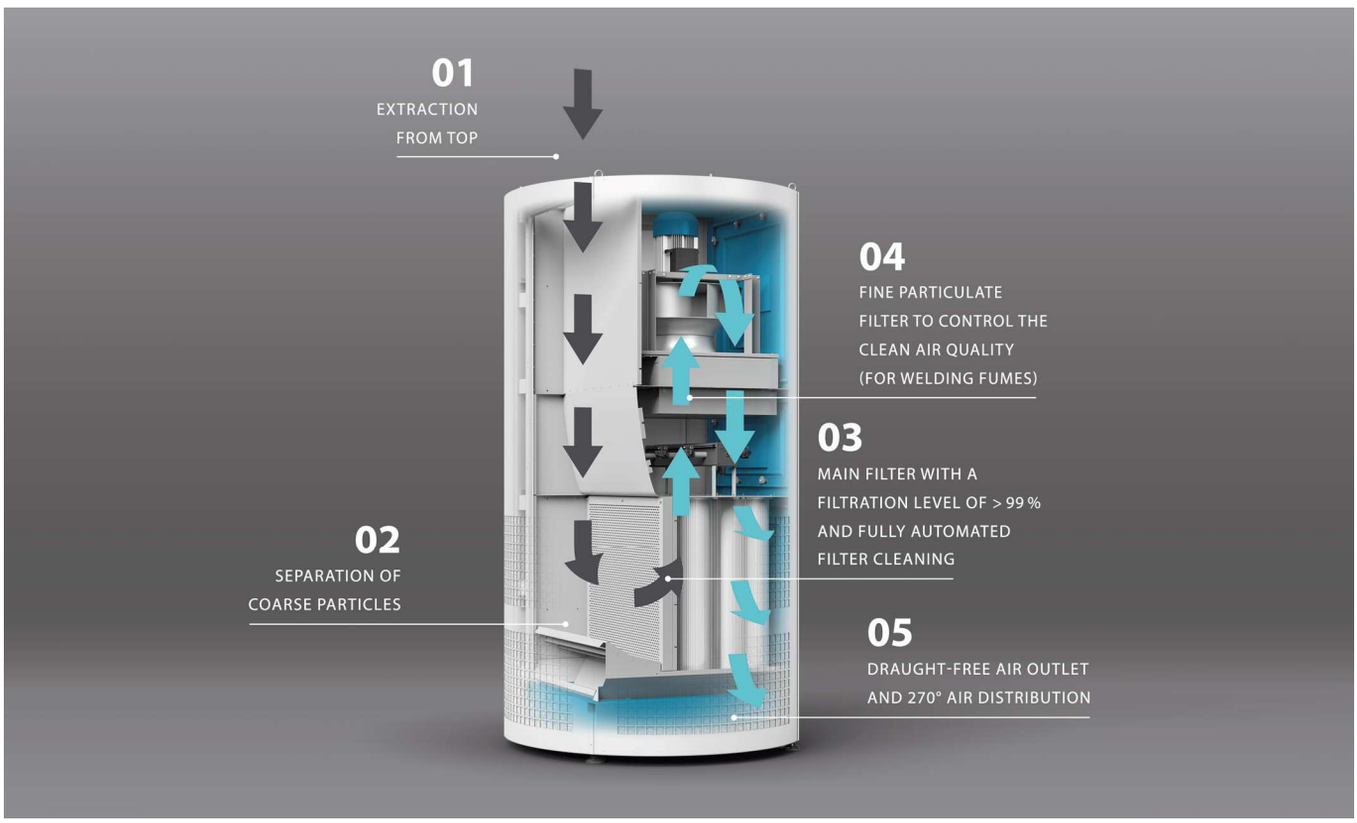
Clean air around the filter tower; the rising welding fumes can be seen on the left



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