Explosion Protection in a Printing Ink Production Plant

Explosion protected electrical apparatus in the newly constructed Jänecke + Schneemann printing ink production plant

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Figure 1: New plant building of the Jänecke + Schneemann company in Höver on the outskirts of Hannover, Germany

Jänecke + Schneemann, one of Germany's oldest printing ink production plants, is located on the outskirts of Hanover and was founded in the year 1843 by the printing press proprietors Friedrich and Christian Jänecke, and the innkeeper Friedrich Schneemann. The range of products covers offset inks, liquid flexo and rotogravure inks, and screen printing inks for use in a wide variety of printing processes and printing substrates. These are used in many fields, such as, flexible packagings (carrier bags and deep-freeze packagings), printed articles made of paper (cardboard and bags with or without handle), and labels and foodstuff packagings (e.g. sausage casings).

By the end of World War II the production facilities had been virtually destroyed so in 1957 after a provisional reconstruction the company moved to a new location in Hanover. With the continually increasing production volume the company soon outgrew this site with its 20,000 sq. m. Consequently, the company acquired a new site with 48,000 sq. m in Höver, on the outskirts of Hanover, in order to meet the rising space demand.

Figure 2: Container with filling plant and central control station for raw material delivery

Figure 3: Socket-outlet board in the outdoor raw material-delivery area

A 7,000 sq. m production facility was constructed here in the Autumn 2002, this being the first stage of a larger construction project. Initially, only the liquid flexo inks are being produced at the new plant (Figure 1) owing to recent safety-engineering and environment-engineering demands. The entire production facility is classified as Zone 1 due to the substances containing solvents that are used and owing to the possible hazardous compounds. Consequently, all electrical equipment is designed as explosion protected. This equipment extends from installation switches and circuit-breakers, fluorescence lighting, signal lights, signal horns, control stations and junction boxes through to operator interface terminals. Almost all this explosion protected equipment has been supplied by R. STAHL Schaltgeräte GmbH in Waldenburg or Weimar, Germany, and R. STAHL HMI Systems GmbH in Cologne, Germany.

The electrical wiring was performed by Wahl & Co. GmbH of Seelze, Germany, in very close cooperation with the user and TÜV Hanover, a German Technical Inspection Authority, which was also responsible for inspection prior to commissioning.

The production process which run over an area of approx. 6,500 sq. m are subdivided into four zones: delivery and storage of raw materials, dispersion of the solvents and colour pigments, intermediate storage and dosing of the inks and, finally, filling various sizes of container with the inks.

As already mentioned, the entire production facility is designed on the basis of the most recent safety-engineering and environment-related aspects. Thus, even during delivery and storage of the solvents, importance is attached to strict compliance with regulations. The liquid raw materials are routed from underground tanks in the outer area into the plant building. Sixteen underground tanks, each with a capacity of 30 cubic metres, are filled with the liquid raw materials, and are controlled by a central control station (Figure 2).

The tank supply lines accommodated in the central control room are controlled and monitored by means of an explosion protected operator interface terminal of Type ET 125 in conjunction with an 8146 control station. Moreover, safety of operating personnel is ensured by means of an explosion protected signal horn of Type 8491. In addition, the apparatus shown in Figure 3 in the outside area ensures that no hazardous situations can occur during delivery. The installation switch 8030 and the safety switch of Series 8537 safely shut down the plant in the event of danger.

Depending on the production orders, the raw materials stored in the underground tanks are distributed further within the production facility. This is done by means of a distribution panel (Figure 4) via which the various components for the inks can be selected. The components, selected in this way, are transferred to large impeller-type mixers for further processing.

A further process step involves the colour pigments and solvents mixed together beforehand in a tank being dispersed. The degree of dispersion, i.e. the fineness of the ink, is an important quality criterion for perfect printability. The solvent and pigment mixture is pre-dispersed under a dissolver in a first step. ➔

Figure 4: Interior view of distribution panel

Figure 5: Cone mixer mill for dispersion

Figure 6: Control switch 8008 and control station 8146 in the intermediate store's filling system

Figure 7: EXLUX 6000 lighting of the production facilities

The second step involves ultra-fine grinding of this preparation by means of a cone mixer mill for dispersion (Figure 5).

The most important quality indices (e.g. degree of dispersion and viscosity etc.) of the printing inks are monitored continuously by the quality management system during the entire production process. If the required degree of fineness is reached, these intermediate products (primary colour inks) are stored temporarily in tanks with a capacity of 2.5 metric tons. Transfer of the intermediate products as well as storage and further distribution are controlled by means of the control stations of Type 8146 and the control switches 8008 (Figure 6).

The various primary colour inks are removed from these intermediate storage tanks via an automatic weighing and dosing station, and are then mixed to form the end product. After quality inspection, the finished ink is then decanted into a whole array of delivery packagings ranging from 10 kg cans through to 1,000 kg containers.

The entire production area is illuminated both inside and outside by explosion protected luminaries of the Series EXLUX 6000 (Figure 7). Thanks to selection of the materials and the rugged design, the EXLUX 6000 luminaries are ideal for resisting the aggressive media and other ambient influences, thus ensuring safe workflow.

The production facility of the Jänecke + Schneemann company complies not only with the most recent safety-engineering requirements (e.g. requirements pursuant to the ATEX Directive 94/9/EC) but also with the latest environmental regulations. One of the systems the facility uses is a ›Thermal Regenerative Exhaust System TRE‹. This allows the air which contains solvents to be cleaned by combustion and discharged into the environment as solvent-free. In return, the energy produced during the combustion process is reused in the ink production process.

The second construction stage will be implemented in two to five years. The rest of the workforce will then also be housed in the plant buildings which will then have a size of 15,000 sq. m. The corresponding structural precautions (e.g. the space required for a further TRE System) for the second construction stage have already been granted. With this new building and the planned extension, the Jänecke + Schneemann printing ink production plant will be in a good position to compete on a successful basis against its international competitors.