

Report No.: 50 441 – 16/2

Title: Reduction of the emissions of total carbon and in particular of glycol in the exhaust air of glass-fibre production

Summary

The project "Reduction of the emissions of total carbon and in particular of glycol in the exhaust air of glass-fibre production" was implemented during the period from May 2003 to October 2004. The background was the equipping of two new production lines for fibre production with electro-filters intended to separate the glycol aerosol from the exhaust air. ILK Dresden received a commission to perform measurements to monitor the performance of the filter systems. The emissions from the plant were recorded in 3 sets of measurements and the effectiveness of the filters was checked. With the aid of continuous recordings of relevant operating data, such as exhaust air volumes and pressure losses, it was possible to optimise the operation of the filters. Summarising the results, it is possible to draw the following conclusions from the project:

- The use of glycol as an antistatic medium for the production of textile glass fibres gives rise to a glycol aerosol with a maximum concentration at a particle size between 20 and 50 nm.
- The aerosol can be separated from the exhaust air with a separation effectiveness of >90% with the filter modules, pre- and post-filters, and the emissions can thus be reduced to <5% of the amount of glycol used.
- The handling of the project showed that it is not recommendable to seek to detect diethylene glycol in the exhaust air by way of FID due to the very small gaseous proportion.
- Droplet measurement with a mobility spectrometer proved to be the suitable measuring method, allowing determination of the separation performance down into the nanometre range.
- Deposits on the isolator of the ioniser and collector cells led to flash-overs and in individual cases to failure of the cells. Optimisation of the isolators with new materials is able to guarantee the low-maintenance operational reliability of the system.
- Due to the glass fabric inserts in the pre-filters, which retained the glycol and could not be regenerated, the pressure loss of the filter modules increased significantly over a period of operation. It was possible to solve the problem by eliminating the glass fabric inserts in the pre-filters, though this led at the same time to a deterioration in the degree of separation in the filter modules. The separation performance, however, remained constant thanks to the increased exhaust air flow rate.

- Emissions reliably complied with or else remained well below the applicable thresholds for all systems conditions.
- Clearly visible reduction of the mist formation at the chimney exit was achieved.
- Use of the system enables more than 6 t glycol per year to be recovered and passed on for suitable recycling.
- The content of pollutant in the exhaust air was reduced to the extent that no problems arise regarding return to the production halls in accordance with VDI 2262.

Handling of the project confirmed that the electro-filter module is the correct filter type for the separation of diethylene glycol in the form of a finely dispersed aerosol from the exhaust air. The targeted degrees of separation were achieved and it is thus possible to return the exhaust air to the production halls. Furthermore, the comprehensive measurements and investigations enabled experience to be gathered in the detection of diethylene glycol in exhaust air and produced recommendations for analogue measuring tasks.

The results of the project are thus transferable to comparable plants and exhaust air issues and assist operators, measuring institutions and authorities in their planning and assessments.