Case Study

Extraction Of Emulsion Mist From Various CNC Machine Tools Using Central Extraction

CNC machining and milling centres and CNC lathes are cutting machine tools, i.e., a workpiece is shaped by means of material removal using tools such as borers, cutters, lathes.

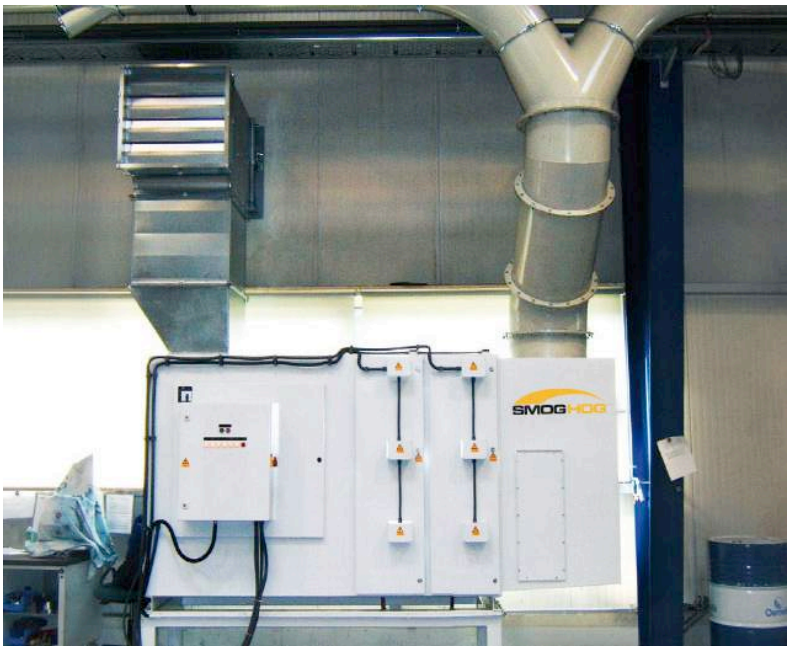
The term “lathe” was originally derived from the workpiece being rotated on a spindle (of an axis).

Today’s “centers” have several axes, in which tools and workpieces move. Workpiece and tool changers supplement the systems so that complex geometries can be produced on one machine tool.

The “CNC” in the name is derived from Computer Numeric Control, which means that production processes can be programmed and the programs stored in the memory of the machine. Ergo, repetitive production procedures only need to be called up. There is the tendency to automate heavily and to minimize interventions by the operator.

Today’s high-speed processing requires the introduction of cooling lubricants. These are used to cool the cutting edges on the direct contact surface to the workpiece during the cutting procedure, to lubricate the contact surface and remove any arising chippings through “purging”.

Through the rotation and energy input, the cooling lubricant forms an aerosol mist at this moment, which is extremely hazardous to health if inhaled.



Problem:

Mauersberger und Fritzsche is an SME with a long tradition in gear manufacturing for drive technology and in the production of high-quality structural steel cupped shears. The company has CNC machining and milling centers from renowned manufacturers, such as Monforts, Doosan, Yang and Mori Seiki, in which workpieces are cooled, purged and lubricated with water-soluble cooling lubricants (emulsions).

The task, which the corporate management addressed to Parker Hannifin, formerly UAS, was to improve the air climate in the hall using a filter system.

Solution:

The company’s machinery comprises approximately 10 machine tools. For this reason, the advantages and disadvantages of single-station extraction units were weighed up against a central extraction system.

PH1810-036

Parker Hannifin Corporation
Industrial Gas Filtration and Generation Division
4087 Walden Avenue
Lancaster NY 14086 USA
Ph: 800-252-4647
Ph: 513-891-0400
smoghog@parker.com

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The advantages of a central extraction system prevailed in this project. On balance, the investment costs are lower despite higher costs for piping and assembly, while maintenance is concentrated on a central point.

In addition, a summer/winter set-up as hall ventilation can be realized easily with this concept, which permits exhaust air operation in the summer and a recirculated air operation in the winter to save heating costs. In general, it is not possible to give one blanket answer to the question about single-station extraction units or central extraction systems. This must be decided on the facts of the relevant plant. However, as a general rule, the overall or life cycle costs of a central system with a ventilation system performance from 6,000m^3/h tend to be lower.

In this case, a two-staged electrostatic filter is used as filter, which reliably filters out harmful substances and emulsion mist, such as aerosols, and offers the client an approximately 15% reserve for production expansions.

The client was initially sceptical towards the electrostatic filter solutions. However, thousands (!) of installed SmogHog electrostatic filter systems have proven the opposite over the last decades: even oil and emulsion mists can be filtered with outstanding results if you have 50 years of knowledge like Parker Hannifin.

Knowledge, which can also be seen, for example, in the piping used for raw (polluted) gas, as this should be made of longitudinally welded steel and be oil-tight on the flange connections. “Cheaper” folded spiral-seam pipes are reputed to save costs but, according to Parker Hannifin experience, they carry a risk of a production hall becoming a “stalactite cave”.

By visiting a comparable reference system near the client’s company, Parker Hannifin was able to convincingly prove this knowledge, dissipate the reservations and win the trust of the user. This and independent measurements by the Institut für Luftund Kältetechnik convinced the client to award the contract to UAS, now Parker Hannifin.

The client is very satisfied with the performance and maintenance intervals of the system, especially as they clean the filter elements on-site and reuse the filter inserts.

The Advantages at a Glance

- Higher filtration efficiency of oil and emulsion aerosols - even for the smallest particles (< 1µm)
- Lower energy consumption due to the low pressure losses of the filter system - almost independent to the contaminant loads and load capacity of the filter elements
- No disposable parts and, consequently no need to dispose of the filtering media (hazardous waste)
- Equipment design is tailored by Parker Hannifin to the user’s needs
- Equipment in use for at least 10 years (up to 25 years with Parker Hannifin service)

Key Technical Data

- Product SH 60/T with two electrostatic stages in series
- Suction output under operating conditions: 12,000m^3/h
- Power consumption of ventilator: 7.5kW
- Power supply: 400V/50Hz
- Filter weight: approx. 900kg
- Filter surface: 156m^2 electrostatic
- Pressure loss of filter: 1.5mbar (150Pa)
- Paint RAL 7035
- Max. process temperature: 65°C

We thank Dr Truschka and the company for approving this article and the pictures.

Authors: Carlo Saling, Norbert Jedrzejak and Jörn Jacobs

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Lancaster NY 14086 USA
Ph: 800-252-4647
Ph: 513-891-0400
smoghog@parker.com

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