



Innovative exhaust air technology for die casting machines

- New construction of a foundry for structural components using modern KMA extraction and filtration technology

In modern production plants, clean air in the working space is an absolute must. Product and workplace quality as well as certification requirements make measures for air pollution control absolutely necessary. The exhaust air generated by foundry machines is composed of oily and often pasty smoke and aerosol substances. The continuous use of these machines results in a high smoke pollution, which has to be separated. The exhaust air technology in modern foundries therefore offers a high energy saving and CO₂ avoidance potential. The joint venture GF Linamar used a modern exhaust air filtration system from a specialist when planning its new light metal printing plant for structural and drive solutions in North Carolina (USA).

When planning its new light metal printing plant for structural and

Energy efficient operation as a must

GF Linamar is a joint venture between GF Casting Solutions, a division of the Swiss Georg Fischer Corporation and the Canadian LINAMAR Corporation. The joint project between the two companies combines the casting expertise of GF Casting Solutions with the diversified manufacturing expertise of Linamar Corporation. With the joint venture in Mills River, North Carolina (USA), GF Casting Solutions supplies the US market with lightweight components for the automotive industry.

GF sets high standards for each production facility concerning occupational safety, environmental protection and energy efficiency. In order to make the new production facility even more efficient regarding energy consumption and to further reduce any possible environmental impact, GF Linamar invested in forward-looking exhaust air technology.



The 23-hectare light metal die casting plant specializes in the production of aluminium and magnesium lightweight components for the automotive industry.

In modern production plants, air pollution control measures have not only to meet the requirements of occupational safety and environmental protection, but have also to ensure an energy-efficient operation. In foundries, energy consumption is strongly dependent on the energy input of the exhaust and supply air systems. High energy consumption results in high production costs and high CO₂ emissions. Through the use of energy-efficient exhaust air filtration systems, foundries can realise considerable cost savings of up to 85 percent, improve the CO₂ balance of the production facility and contribute to climate protection at the same time.

Conventional exhaust air technology is energy-intensive

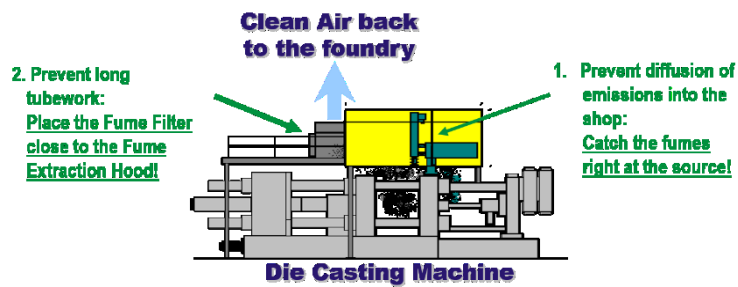
During conventional exhaust air purification, the exhaust air is extracted from below the hall roof (not selectively at the machine) and transported outside. To create clean air at the workplace according to occupational health and safety requirements, the air has to be changed 10 to 12 times. However, the higher the exhaust air volume, the higher is the energy consumption and thus the operating costs. Therefore, industrialized countries worldwide are now increasingly relying on selective air extraction at production machines combined with 3 to 4 central air changes in order to keep air flows and thus energy costs low.

The exhaust air is extracted directly above the machines by fitted hoods to keep the amount of extracted exhaust air low. It is then filtered using basic demisters and afterwards transported outside using fans. Due to the basic filtration, the emissions are only transported from the inside to the outside of the production plant. While this process reaches occupational health and safety requirements it does not align with environmental protection values. Furthermore, this process entails high follow-up costs by transporting the exhaust air outside during the cold winter months, as the air transported outside has to be replaced by the same amount of fresh air from outside. Heating the cold outside air to room temperature leads to immense operating costs and thus high CO₂ emissions.

The goal: high clean air quality

Innovative filtration technology allows for cost-saving alternatives to conventional exhaust air technology. Therefore, GF Linamar implemented the energy-saving system for exhaust air purification of a field specialist. KMA Umwelttechnik provides complete solutions for industrial exhaust air filtration and has specialised for many years in energy-saving methods of exhaust air treatment in foundries. In the GF Linamar foundry, each aluminium die casting machine is equipped with its own KMA ULTRAVENT® system consisting of a fitted suction hood for smoke extraction and an electrostatic precipitator for particle separation. The implemented exhaust air filter system has an individual filter capacity of 20,000 m³/h and an automatic filter cleaning

system for minimum maintenance. In recirculation mode, each filter system is located directly above the respective die casting machine.



Modern exhaust air filter systems enable high clean air quality at low energy consumption (here in circulating air mode).

The customized exhaust air extraction systems are installed directly above the emission source. This prevents the smoke from spreading and polluting the hall air, thus requiring the extraction of a much higher volume of exhaust air: The lower the amount of exhaust air to be cleaned, the lower the energy costs are.

During the second step, powerful filter technology is used to achieve such a high clean air quality that the purified exhaust air at the filter outlet can be returned to the working area. The air circulates in the hall and thus experiences no heat loss due to exhaust air. This procedure reduces the energy costs of an expensive air exchange. At the same time, the foundry's CO₂ balance improves, i.e. for a die casting machine of 2,200 - 2,400 t, the annual CO₂ emissions can be reduced by more than 30 to 40 tons due to savings in heating energy.

In addition, the circulating air mode offers further advantages for a simple and flexible installation of the filter system in the production plant: complex exhaust air piping (required for exhaust air operation) is no longer required, the individual filter systems operate at the same time as the casting machine. This allows for a flexible expansion of the production using new machines. This process is therefore widely used in new foundries.

Connecting casting machine and exhaust air filtration system

In a modern casting cell, various peripheral technologies are integrated into one coherent system. The basis for an intelligent connection of the exhaust air filtration system with the casting machine is the advanced communication between the respective control systems.



This modern die casting cell has an exhaust air volume of 20,000 m³/h and is equipped with its own KMA smoking hood and filter system

In GF Linamar's pioneering foundry, the filtration technology

can adapt to the current exhaust air requirements of the respective casting cell. By synchronizing the technical interfaces, the ventilation cycle of the filter system adapts to the spraying cycle of the die casting machine. During the spraying pause, the ventilation can be reduced to 75 percent with the aid of a frequency converter in order to reduce the electrical consumption. Such an efficiency measure allows energy savings to be made on each individual casting cell.

Furthermore, in the age of industry 4.0, enhanced communication (ProfiNet) between the casting machine and the filter system forms the basis for many safety-relevant measures in

the area of fire protection and occupational safety, such as Auto Start/Stop, emergency control, etc.

Additional fire prevention systems

Next year an additional magnesium die casting machine will be installed in the GF Linamar light metal die casting plant. The new plant will also be equipped with modern exhaust air technology. Due to the increased fire protection risk, active fire protection systems for the filter technology will be installed on the smoke extraction hood in addition to the already established safety standards.

"The six exhaust air filtration systems in the new light-metal die-casting plant of the GF joint venture have been running for around one year and are delivering convincing results," says plant planner Dominik Mann. The exhaust air filtration systems run at low operating costs and require minimal maintenance. The trusted exhaust air technology will also be implemented at future die casting machines at the Mills River site and for other international projects.

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