

## Press Release

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### Maag gear pumps as extraction pumps in distillation processes

**Gear pumps from Maag Pump Systems Textron AG are used for demanding applications in a wide range of chemical and industrial processes. Here, the pumps fulfil a variety of roles, including the build-up of pressure, metering, transportation and extraction of fluids. Extraction pumps for various distillation devices like thin film evaporators, short path evaporators or molecular distillation plants are an important example which shows how these pumps can be used in chemical processes.**

Distillation is an important separating process which is used in the production of foodstuffs, chemicals, pharmaceuticals, cosmetics and plastics. As distillation processes normally take place under vacuum, high demands are placed on the extraction pumps - in particular in terms of leak-tightness, efficiency and low pressure losses at the inlet. The latter in particular - loss of pressure at the inlet - is a key factor when choosing an extraction pump, as ongoing optimisation of processes has enabled the vacuum to be steadily increased and thus the feed pressures of the pumps to be steadily reduced.

The basic components of a distillation plant are an evaporator and a condenser. Heat is added to evaporate the medium with the lowest boiling point, after which the heat is extracted again and the vapourised medium is cooled back to a liquid state. However, in order to minimise stresses on temperature-sensitive products and to shorten the process time, an effort is usually made to keep the process temperature as low as possible. This is why distillation plants are operated under vacuum, as the boiling pressure is reduced under the lower absolute pressure. In order to optimise this vacuum and therefore also the effect of the lower process temperature, thin film evaporators or even short path evaporators are used in time and temperature-critical applications. With these types of distillation plants, the short distances between the evaporator and the condenser and the absence of static pressure from the column of liquid mean that a very high vacuum can be achieved. In addition, the thin films of liquid prevent the formation of bubbles, which leads to improved thermal conductivity and more uniform input of heat. If the distances between the evaporator and the condenser are very short and the pressures in the evaporator are very low ( $< 0.01$  mbar) then the distillation process is referred to as molecular distillation. In this type of system, the mean free path of an evaporated molecule is of the same order of magnitude as the distance between the evaporator and the condenser. As a result, the probability that an evaporated molecule will collide with the condenser first is higher than the probability that it will collide with another molecule first. This technique is very gentle on the product, as the molecule is only evaporated once and no diffusion takes place back onto the surface of the evaporator. Furthermore, with the aid of this technique it is possible to separate mixtures of materials independently of their boiling points, as the distillation process takes place as a function of the size and weight of the molecules.

A specially designed gear pump is then needed to extract the distillate from this high vacuum. One of the advantages of the Maag pumps is that they offer the very low NPSH value required in this type of system. This value describes the pressure required by the pump to ensure that the liquid in the pump does not evaporate. The difference between the feed pressure and the vapour pressure of the liquid must be enough to overcome the pressure losses at the inlet of the pump. Maag Pump Systems Textron AG have been able to minimise this required pressure through special inlet geometries and optimised pump speeds. If the pressure loss at the inlet is greater than the difference between the feed pressure and the vapour pressure, then the product will evaporate at the pump inlet and then implode in the gaps between the teeth when the pressure is built up, resulting in cavitation.

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Another strength of the Maag pumps is the low temperature increase of the medium in the gear pump. As some of the transported liquid is used for lubrication of the bearings and then returned to the suction side of the pump, it is important to ensure that not too much heat is input into the medium. Due to the higher temperature of the liquid at the inlet, its vapour pressure would also increase as a result, which again could cause cavitation under the same feed pressure.

Thanks to Maag Pump Systems Textron AG's many years' of experience in the plastics industry, where special extraction pumps are used to extract highly viscous molten polymer masses from reactors which also operate under vacuum, Maag are the perfect partner for solutions to this type of problem. By using optimised material pairings, gear play categories and inlet geometries which can be combined from modular building sets to form customer-specific solutions, Maag Pump Systems Textron AG are in a position to meet this and many other specialised and demanding challenges. Whatever the application requirements in terms of low supply pressures, highly viscous media, corrosive media, high pressure differentials, high temperatures or a combination of all of these - Maag are ready to meet the challenge and supply the perfect solution to your pumping needs.

**To find out more about how Maag Pump Systems can help you with your application, please contact your nearest Maag Pump Systems Textron representative.**

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