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A woodworking machine manufactured by Felder Group.



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Felder: Sustainability, Water Recycling, and Energy Saving in the Production of Woodworking and Metalworking Machinery, with the Atmospheric Pressure Mechanical Compression Evaporation Technology

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Saving resources, energy, disposal costs, and labour for pre-treatment while raising rinse water quality? It is possible, with a closed-loop water treatment system downstream of the pre-treatment station, which allows water to be recirculated after purification. By implementing an atmospheric pressure mechanical compression evaporator built by MKR Metzger into its system, Felder Group (Hall in Tirol, Austria) has achieved an ambitious goal: reducing water consumption and saving 70% of disposal costs through ultra-low energy technology.

Edgebanders, wide belt sanding machines, sliding table saws, saw-shapers, intake systems, hot presses, brushing machines, bandsaws, jointer-planers, boring and mortising machines, and combined systems: these terms, which define a range of machines and tools for processing wood, aluminium, and plastics for both the industry and the DIY sector, represent the core business of Felder Group, a Tyrolean company headquartered on the outskirts of Innsbruck (Austria) and a long-standing manufacturer of machine tools, now in the third generation of its founding family. Driven by a tireless spirit of innovation, Felder Group develops smart solutions and products for all users who want more than just a machine. From a small pioneer in the sector to a technologically advanced industry operating on an international scale, Felder has been maintaining the same values for decades, especially the will to provide each customer with the perfect tool for their success story. Indeed, Felder's product quality is also based on close cooperation with its customers, thanks to which the company can incorporate any requirement into innovative and customised machine concepts. Its strong environmental awareness, also tied to being surrounded by one of the

The 5-stage pre-treatment system of the coating line for small and medium-sized parts.



most beautiful mountain areas in Europe, motivates Felder to keep further improving its plants, processes, and production technologies based on two approaches: energy efficiency and the saving of natural resources.

The most recent investment in this field involved the treatment and reuse of the water used in its powder coating pre-treatment process, a production phase to which Felder has devoted two semi-automatic lines. The implementation of an atmospheric pressure mechanical compression evaporator built by MKR Metzger (Germany), represented in Italy and Austria by FI.T. Filtration Technologies Srl (Bolzano, Italy), has enabled Felder to limit its water consumption and reduce its disposal costs by 70% through ultra-low energy technology.

Vertically integrated production

Sheet metal processing, laser cutting, metalworking, painting, storage of the finished machines in an automated vertical warehouse, packaging, and shipping: Felder's production is fully vertically integrated, with reduced reliance on third-party suppliers. This allows the company to maintain total and constant control over its products, from the reception of raw material through to



The powder application booth of the coating line for small and medium-sized parts.



The powder application booth of the coating line for large parts.



The atmospheric-pressure mechanical compression evaporator manufactured by MKR Metzger.

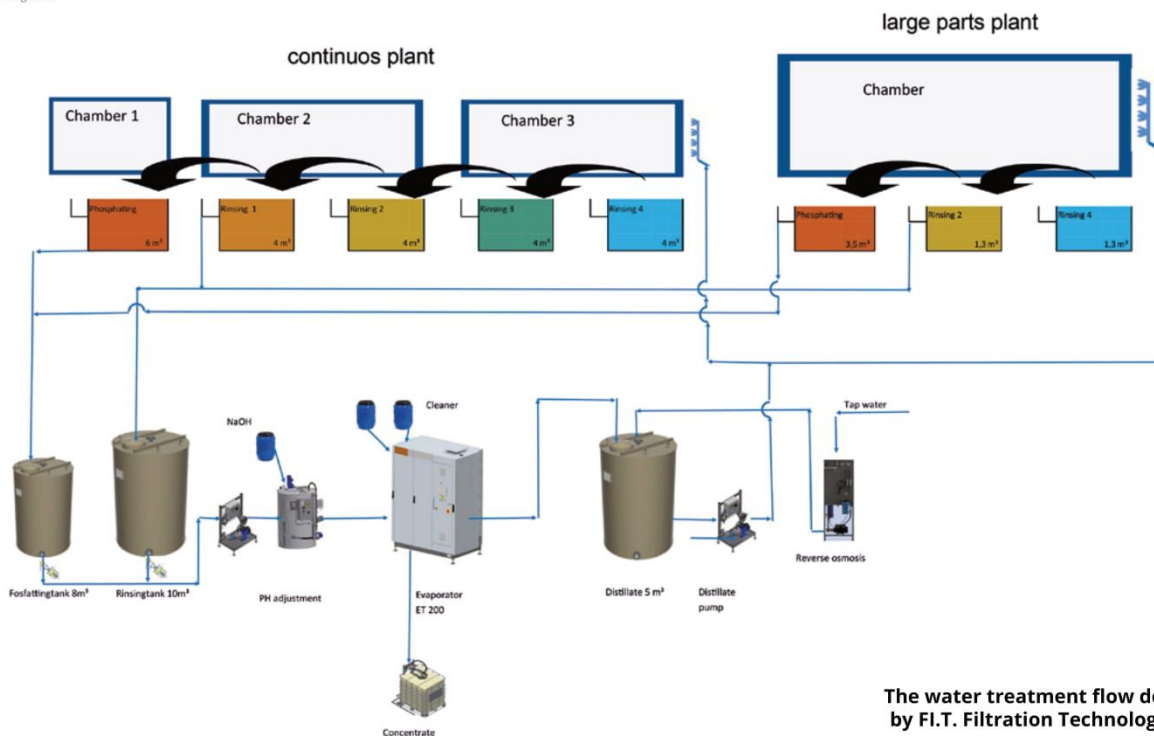


The system for sucking in water from the underground storage tank.



The inside of the evaporator.

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The water treatment flow designed by F.I.T. Filtration Technologies Srl.

finishing. For the latter phase in particular, it uses two semi-automatic powder coating lines that give it the necessary flexibility in terms of parts size and shape, substrates to be coated, and applied colours.

The oldest line is devoted to painting small and medium-sized parts.

This is a step-by-step system with a 5-stage pre-treatment cycle: phospho-degreasing, two cascade rinses with osmosis water, and two cascade rinses using a mixture of distilled and osmosis water since when FI.T. has installed the MKR evaporator. After drying in an oven at 40 °C, the parts enter a cooling area and then reach the powder application booth and the curing oven.

"This system is very flexible," says Felder Group coating manager, Michael Brunner. "We mainly apply ten standard colours, but we can do any tint to order, as we can change colour even from one load bar to another."

The second semi-automatic plant has the same configuration as the first, but it coats larger workpieces.

This is a step-by-step system as well, with a 3-stage multi-metal pre-treatment process that includes phospho-degreasing and two cascade rinses with osmosis water and distilled water from the evaporator. For Felder, the inclusion of the MKR evaporator was not only a way of reusing pre-treatment water, thus dramatically reducing the consumption of this natural resource while lowering disposal costs, but also of increasing the quality of its pre-treatment



The concentrate collection tank.

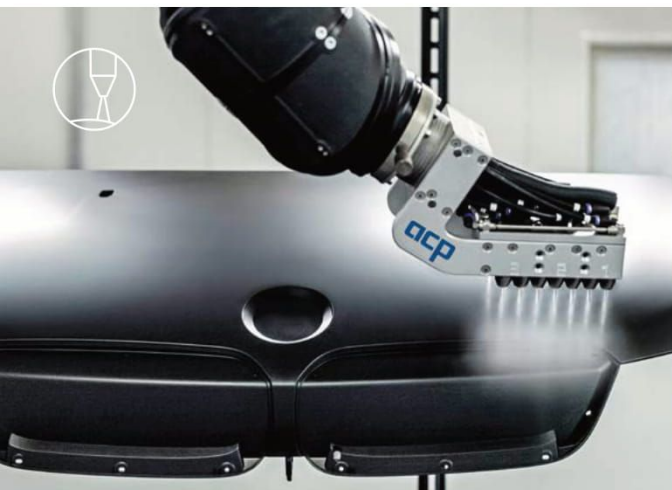
operation, and therefore of its coatings, through the use of high-quality distilled water.

An efficient, easy-to-manage, and flexible water treatment system

"The MKR mechanical compression evaporator I installed at Felder treats both coating lines' rinse water volume," explains Klemens Schwienbacher, the owner of FI.T. Filtration Technologies Srl, a small company specialising in consulting and the supply of filtration and water treatment systems, which holds the exclusive rights for MKR Metzger

products in Italy and Austria. "The rinsing water is stored in an underground tank. From here, the treatment system sucks it in and, after neutralisation with caustic soda, conveys it to the evaporator. Afterwards, the distillate produced by the evaporator returns to the pre-treatment line."

"Our evaporator produces a very pure distillate that can be reused as pure process water," indicates René Schumann, the sales manager of MKR Metzger (Monheim, Germany), an innovative company run by the second generation of its founding



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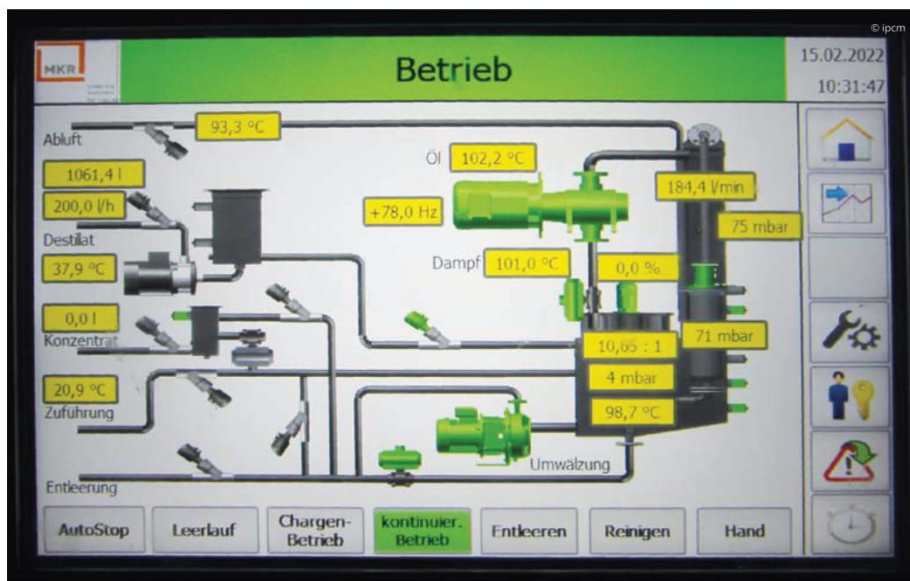


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The evaporator's control panel.



The pH control system.

family, which, in addition to highly innovative evaporators, offers a complete range of water treatment products. "The distillate leaving the evaporator feeds the last rinsing stage of both pre-treatment lines and from there it cascade-feeds the upstream stages, up to phospho-degreasing. The closed-loop water treatment system only externally disposes of the evaporator concentrate, which is collected in small 1000-litre tanks."

"The evaporator installed at Felder has a capacity of 200 l/h, it operates 24 hours a day with continuous discharge of concentrate, and it performs an automatic cleaning cycle after 200 hours of operation," adds Klemens.

"The evaporator's output is managed automatically. When there is little water to treat, the flow rate automatically decreases, as the machine can operate with less than half the original flow rate."

"A major advantage of MKR's mechanical compression evaporation technology compared with other technologies on the market, such as vacuum evaporation, is the considerable energy saving it guarantees," says Schumann. "Moreover, evaporation at atmospheric pressure further reduces energy consumption. An additional advantage of our larger evaporators is the possibility of using the resulting thermal energy to feed the machine with steam." Klemens notes: "This technological aspect is very interesting for large evaporators; however, it cannot be applied to Felder's evaporator, since it only draws 10 kW."

"From the installation of the evaporator last August until the end of December, we have treated 350 m³ of incoming water and disposed of only 14 m³ of concentrate, that is, 4% of the total waste water volume. We have achieved 70% economic savings compared with our previous disposal costs, including the rebuilding of the phospho-degreasing bath, whose sludge (about 6 m³) is not treated by the evaporator but is disposed of externally twice a year," explains Michael Brunner from



From left to right, Michael Brunner from Felder Group, Klemens Schwienbacher from FI.T. Srl, and René Schumann from MKR Metzger.

Felder. "Undoubtedly, the investment in our water treatment system with the MKR evaporator has brought us a considerable advantage in terms of running costs as well as water saving, which is key to environmental sustainability. A zero liquid discharge operation was our main goal, and I must say that we achieved it brilliantly! We opted for FI.T. and MKR out of three different offers. The reason for this was not the investment cost, but the sound project developed jointly, the assistance provided during the start-up phase, and the proximity

of their technical service staff. We are very happy with our choice, especially since their support was crucial during the first months of the machine's commissioning. FI.T. is a technical partner that responds immediately to any call and MKR's technicians are always on the ground in a very short time."

"In my long experience in the water treatment sector, I have met many customers who are great experts in their trade as coaters," says Klemens Schwienbacher from FI.T.



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"Many of them know that their pre-treatment processes have a few pain points, often related to the quality of rinses, but they do not want to deal with them, because they are afraid of having to install a new system complete with an evaporator. However, I can take the time to analyse their issues in detail and find the right technical solution together with them. Moreover, considerable improvements can often be found just by optimising the water flow or by installing an oil separator, a dirt separator, or a demineraliser."

Conclusions

Sustainability, environmental awareness, and efficient use of resources are Felder Group's daily business. 100% of the electricity used in its factory comes from renewable energy sources; the building has a complex thermal energy recovery system; its production plants are among the most modern; and the optimisation of energy consumption saves 320,000 kilograms of carbon monoxide per year, equal to the CO₂ output of 25 homes. The closed-loop water treatment system implemented by FI.T with MKR technology is its latest feather in the cap in terms of sustainability. 

MKR technology: high purification efficiency combined with energy saving

The machine supplied to Felder Group is an ET 200 model, with a production capacity of 200 litres of distillate per hour. It is a small machine in the MKR range and, as it has a low flow rate, it only draws 10 kW of specific energy (50 Wh/litre).

MKR's evaporators work on the principle of mechanical steam compression, which consumes very little energy.

In addition, unlike other systems, they operate at atmospheric pressure, which further reduces energy consumption. The combination of these two technologies offers several advantages, including as follows:

- Depending on the size of the machine, electricity consumption is reduced up to 35 Wh/litre.
- With an evaporation temperature of 100 °C and a steam temperature of 105-110 °C, the system also performs a bactericidal action.
- With a temperature difference of 5 to 10 °C between the steam side and the waste water side, fouling of the machine's heat exchanger is reduced to a minimum.
- The temperature difference between the distillate and the incoming waste water is only 15 °C, which avoids overheating the rinses.
- The machine works 24 hours a day and self-adjusts its flow rate according to the level of the feeding tank. When faced with little water demand, it even works with less than 50% of its nominal output.
- Cleaning of the heat exchangers is fully automatic.

An even more interesting feature of MKR's technology is that the evaporators can combine the mechanical compression technology with that of thermal energy in the form of steam, which further lowers the running costs of these machines.



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