Cloud-based urban district

The urbanharbor in Ludwigsburg covers an area of more than 200,000 square meters. It is an ecosystem of gastronomy, retail, and entertainment, as well as start-ups from the region.

COMPANY
max maier urbandevelopment

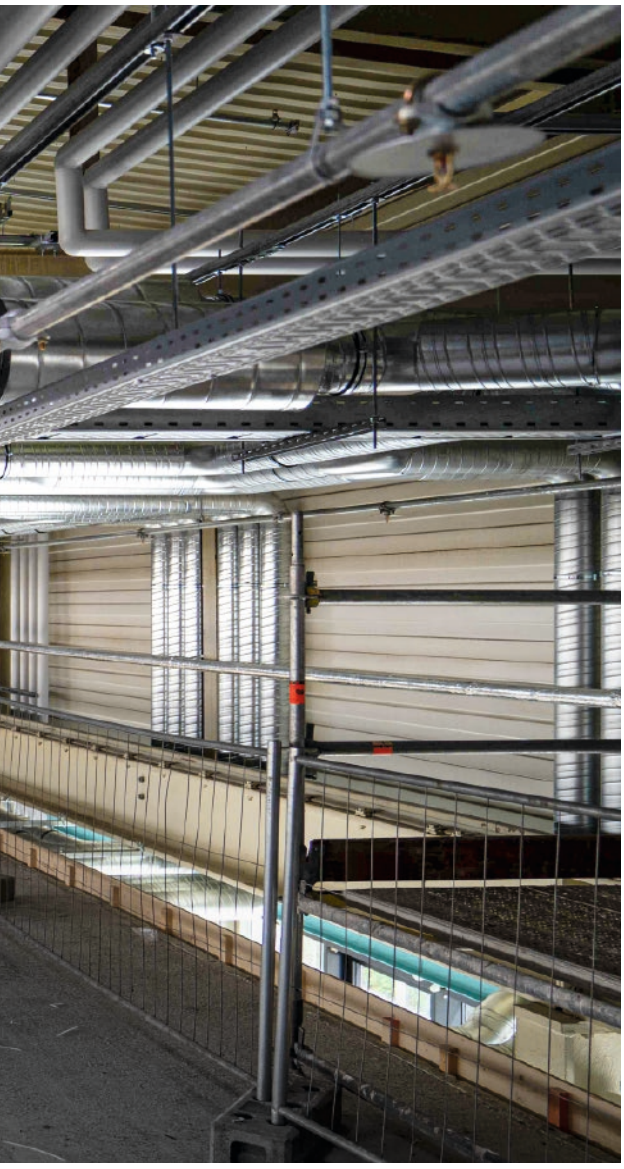
LOCATION
Ludwigsburg, Germany

Europe's very first climate neutral urban district is being established in Ludwigsburg, Germany. It is owned by the Maier family, who have made the most of what digital connectivity has to offer, in order to maximize the site's sustainability credentials via the cloud.

Imagine how great it would be to walk through a room and have the fresh air that you need to breathe follow you every step of the way. And to know that this fresh air is not being provided unnecessarily to empty rooms (after all, who is going to need it there?). This type of system would not only mirror actual demand as closely as possible and minimize wastage, it would also be ideal in terms of climate protection. The ventilation system would not have to work as hard, which would, in turn, save a lot of energy that could be used more productively elsewhere. While this might sound like just a theoretical concept, the “urbanharbor” city district in Ludwigsburg, Germany, has in fact made it a reality.

“Sustainability is the common theme that defines all of my business activities,” says Max Maier Senior, owner of the max maier urbandevelopment district and a visionary from the very outset. “For me, that means not demolishing anything, and instead giving existing buildings a new lease of life.” And that is exactly what he has done with the urbanharbor district—a 200,000-square-meter production site that has undergone a complete transformation.

The production halls that were once used to manufacture refrigerators and similar goods have been transformed into state-of-the-art offices for start-ups from the region, who work to bring their pioneering ideas to life. “Our vision is to be the first operational climate neutral urban district in Europe by 2030,” explains Max Maier Junior, who has been a partner since 2017. “To achieve this, we make sure the energy is supplied exactly where it is needed in order to optimize the processes within this ecosystem. But for this to work, everyone needs



Max Maier Junior and Senior look at the big picture. The urban district of the future is being created, embedded in old production halls.

to collaborate and we need to leverage the benefits of digital connectivity in the cloud."

From electric charging stations to ventilation technology

The most impressive demonstration of this vision can be seen in Hall 8, which is the largest hall and measures some 10,000 square meters. It has been transformed into a "building within a building"—entirely in keeping with the Maier family's overarching philosophy. The old building shell still has a working crane track, but now also boasts new, two-story offices providing the workspace of the future. "This transformation alone means 75 percent less CO_2 than for a new build, because we save a lot of embodied energy that would otherwise be required for construction, raw materials, and transportation," says Max Maier Senior. "The foundations and the basic infrastructure were already in place. And we are using the air cushion between the external and internal facades as additional insulation, like you find on a thermos bottle."

But that is not all that Hall 8 can do: all the areas of the energy ecosystem—the sustainable energy management system, e-mobility infrastructure, facility management, logistics and the food system—dovetail with one another. These range from the solar power system on the roof, to quick-charging stations for electric vehicles outside, to smart ventilation and technical building services, and even multiple-use systems for the food supplies. "We think holistically about how to include all the different aspects," explains Max Maier Junior. "That is why we will collect the data from our various partners in real time in the cloud to build a

Lukas Zwiessele

holistic picture, and then leverage it to manage energy usage across the site in a way that reflects actual demand."

If, for example, all employees want to charge their electric vehicles during their lunch break, and nobody is using the large meeting rooms at that time, the system will redirect the energy from the ventilation system in those rooms to the battery storage system. "But our efforts to interlink all these areas of the energy ecosystem will prove unsuccessful if we fail to take the same approach within each specific area, such as the ventilation and technical building services. If several employees move from their workstations to a meeting room, more air will be needed there and less will be needed elsewhere." Max Maier Senior and Junior opted for an air management concept never before seen in Europe: a semi-centralized ventilation system complete with cloud-based Building Connect platform from ebm-papst, which will enable them to manage the site based on actual demand.

Air supply exactly where it is needed

"Looking back, nothing about this project was straightforward," says Christoph Hornek, CEO of i-on Engineering GmbH, who was responsible for the ventilation and technical building services. "But that just spurred me on even more to try new things." Hornek normally uses air flow controllers in his air conditioning and ventilation systems to regulate the volume in each zone. To regulate the air volume, a control valve is closed until the desired air volume is reached. Energy is wasted

It is still really quiet first thing in the morning. Once the first employees arrive at their workstations or head to meeting rooms, the air is conveyed to exactly where they need it.

The space between the hall facade and the outer wall of the offices is used as additional insulation. However, routing the ventilation ducts here was no easy task for ventilation engineer Christoph Hornek.

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during this restriction of the air flow. However, the idea in Hall 8 was to make sure this energy was not consumed in the first place, and to design the AHU (air handling unit) to have the lowest possible power output. Another key factor was ensuring the best air quality. There are no windows, so the only fresh air the employees have is the air that flows through the ventilation system. This means the air is heated and humidified in winter, and cooled and dehumidified in summer. The system also filters out fine dust and organic compounds (known as TVOCs or total volatile organic compounds) that could make employees feel unwell. In this context, it becomes clear that this valuable air is not wasted. "We see air here as a form of subsistence," says Hornek. "In fact, it is the most important thing we have."

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CHRISTOPH HORNEK

CEO OF
I-ON ENGINEERING GMBH

Achieving these benefits necessitated the use of highly efficient fans that precisely measure the air flow and independently maintain it to suit the demand in each office zone.

Christoph Hornek chose to use EC centrifugal fans from ebm-papst. Around 300 of them have been installed in sound-insulated housings and are located where the air flow controllers traditionally sat. For the employees one story down, they are completely silent. Their compact dimensions were also ideal for Hornek, as the crane track in the old industrial hall restricted the available installation height under the roof to a minimum. But how do the fans know where exactly the 400 employees are located across the 10,000-square-meter site and which level of air performance is required?

The data's path: First it travels from the RESET-certified sensor to the ebm-papst cloud, and is then processed and sent to the fans for control. You can also view all the data on the Building Connect platform.

Building Connect—the brains behind it all

"ebm-papst neo, the digital subsidiary of ebm-papst, had developed software for this specific scenario at that time. I knew immediately that Building Connect was what we were looking for," says Hornek, explaining his decision. This cloud-based data platform obtains real-time data from sensors in the office buildings, processes it in the ebm-papst cloud, and then issues the relevant control commands to the fans. Alongside temperature, humidity, TVOCs, and fine dust, the sensors also measure the CO_2 content in the air—and it is this that determines how the ventilation system responds. "The ideal value is 600 parts per million or less," explains Bernd Röhrscheid, Technical Project Manager at ebm-papst neo. "We find it harder to concentrate once the value reaches 1,000 parts per million, as at this point the air quality becomes noticeably worse. So, once the value reaches 900 parts per million, our sensors start to inform the local fans that they need to increase their air performance accordingly. They then ventilate the rooms until the value is back within the ideal range." As a result, the employees benefit from a comfortable working environment.

Standard-compliant sensors

All sensors are RESET-certified, which means they are certified according to the only real-time-based-internationally recognized air quality standard for indoor applications. The measured values are continuously checked by an independent third party. Building Connect provides Bernd Röhrscheid and Christoph Hornek with an accurate representation of their rooms on their tablets and other electronic devices, meaning they can access all of their data at a glance. The energy consumption can be analyzed and optimized at any time. In future, all data will be sent to the urbanharbor cloud so that the site can be managed holistically, taking into account all areas of the energy ecosystem.

Urban district goes beyond offsetting own emissions

"This concept has enabled us to save around 50 percent of the air that would need to be treated and 30 percent of the electricity that would be required to convey the air," says Christoph Hornek. Max Maier Junior has also done the sums: "In Hall 8, we are assuming a worst-case scenario where, in addition to offsetting 700 metric tons of emissions to achieve climate neutrality, we will actually over-compensate an additional 63 metric tons of CO_2 thanks to producing excess solar power. That is equivalent to planting more than 5,000 trees. Our best-case scenario, however, assumes the hall will over-compensate by around 250 metric tons." The task now is to expand this to the other halls—and from there, perhaps even to other sites around the world. ●

TAKE A LOOK AT THE VIDEO OF THE PROJECT: mag.ebmpapst.com/urbanharbor