

ENGINEERING
TOMORROW

Danfoss

Case story | MTCV Thermostatic Circulation Valves

Why **hot water is key** for happy hotel guests

Hotels across Southeast Europe are scaling down their use of burner oil as a heat source for their Domestic Hot Water (DHW) boilers, instead adopting renewable alternatives such as heat pumps or district heating.

However, if there is no hydronic balancing of the circulation system, guests have to wait a long time for hot water, and hotels face high energy costs.

Leading hotel company Maistra wanted to prepare a sustainable future, as well as improve guest satisfaction and circulation efficiency at one of its 3-star resorts, so made the decision to first stabilize water temperatures by renovating the DHW system.

After installing Danfoss Multifunctional Thermostatic Circulation Valves (MTCV) onto the DHW branches, the hotel achieved consistent water temperatures and reduced the use of burner oil.

Maistra also enhanced internal processes and saved time by centralizing and digitalizing the DHW control and temperature monitoring.

50°C

Minimum
temperature
maintained
consistently

The challenge

The hotel has 228 rooms throughout 4 buildings, each with 16 DHW branches.

The hotel uses an oil fueled boiler for the production of hot water, which heats up to three hot water storage tanks with a capacity of 5m³ each. The system is capable of producing a maximum temperature of 70°C in the tanks.

Within the hot water distribution system there are large distances between the hot water source and the tapping points. This created long wait times for hot water, differences in tap point temperatures, and high water consumption. Branches closest to the source also experienced relatively high temperatures compared to the rest of the system, leading to limescale build up, pipe corrosion, high energy costs, and high maintenance costs.

As building owners need to ensure a water temperature of 50°C within 60 seconds at each tapping point, Oliver Fatorić and his team responsible for the technical services for the hotel needed to find a solution.

Their most important requirement was to reduce wait times from several minutes to less than one minute. In addition, they aimed to increase hotel guest comfort and utilize a more energy efficient solution.

**Stable
temperatures**
were key

“Maistra is continuously working to enhance guest satisfaction and safety. Improving our DHW system was extremely important for us. Danfoss had the high quality, innovative products and expertise that we needed.”

Oliver Fatorić

Head of Technical Maintenance
at Maistra Hospitality Group



The solution

Danfoss investigated and advised that a dynamic, thermal, hydronic balancing solution was needed in order to reduce waiting times in the circulation system. To achieve this Danfoss recommended that the system be fitted with the MTCV (Multifunctional Thermostatic Circulation Valve).

MTCV creates a thermal balanced system by enabling constant temperatures in every circulation pipe, optimizing performance, and ensuring hot water is available when and where it is needed.

Throughout the hotel, a total of 64 MTCV-C valves were installed on the circulation pipes of all DHW branches.

To fulfill the hotel requirements, Danfoss also suggested the use of an electronic monitoring and disinfection solution: CCR2+. The CCR2+ controller provides digitalized temperature monitoring, so it is possible to

see the actual temperatures in the system. It also stores the data so it can be shown to authorities during inspections.

The CCR2+ controller enables an automated disinfection process where, periodically, the temperature in every branch is temporarily increased in order to sanitize the pipes and remove any bacteria that might be present in the system. For this purpose, the thermal balancing valves are equipped with a thermal actuator which is used to open a special bypass inside of the thermal balancing valve. As a result, the system is kept safe and operates at the lowest possible energy consumption.

In each of the 4 hotel buildings a total of 16 temperature sensors and TWA thermal actuators were installed on the MTCV valves (MTCV-C application), all connected to one CCR2+ controller.



**MTCV Multifunctional
Thermostatic Circulation
Valve and CCR2+
electronic controller**



Hot water

**where and when
it is needed**

A thermal balanced system is recommended compared to alternative methods. For example, hotels will often try to increase the temperature at the source in order to reach the required temperature of 50°C at the furthest tapping point and reduce waiting times. However, this is not a sustainable solution. To compensate, the system will increase energy usage. The high water temperatures will also create more technical issues such as corrosion in the pipes and tapping points closest to the source. In addition, high temperatures at the tapping points closer to the source could lead to hot water scalding injuries. This risk should be avoided especially in hotels and hospitals.

“Our guests should not have to wait a long time for reliable hot water and with the MTCV we have reduced waiting times to less than one minute. It has transformed our system and our guests are very happy, which is great for our business.”

Oliver Fatorić

Head of Technical Maintenance
at Maistra Hospitality Group

The result

MTCV valves were mounted parallel to the existing piping. Using additional shut-off valves, each branch can be operated to either distribute the hot water in a non-balanced system, or in a new thermal balanced system.

This was done so that the differences in the system could be measured. In total, three scenarios were tested and monitored.

In the first run, the system was operated like normal. The temperature measurement confirmed the issue with long waiting times, as the furthest located branches had low water temperatures. The oil consumption measured over a 24-hour operation was 103.5 liters.

In the second test, the system was heated to its maximum in order to achieve higher temperatures at the furthest branches. The waiting time was around 20 minutes for the last tapping point to provide the required 50°C. The oil consumption rose to 135 liters over 24 hours.

In the third test, the system was set to use the MTCV thermal balancing valves. The waiting times were reduced to below one minute. The furthest tapping point achieved the required 50°C within that shortened waiting time. The oil consumption was 111.5 liters over 24 hours.

The test confirmed that the system with thermal balancing valves is the safest option and is fast enough to comply with official regulations in Croatia.

The energy consumption increased 7.7% compared to the existing situation. But it reduces energy consumption by 17.4% compared to the aforementioned (and not recommended) method of running the system at maximum temperatures.

Previously guests were running taps for a long time while waiting for hot water, but now they have instant access, so less water is wasted. The savings made by reducing water consumption were not measured but are considered significant.

The total cost of installing 64 MTCVs and 4 CCR2+ controllers was €20,570. By choosing the thermal balancing solution over the maximum heated water temperatures, the hotel has reduced its burner oil use, saving €9,435 per year (based on a burning oil price of €1.10 per liter). This has resulted in a return on investment (ROI) of just 2 years.

In addition, the renovation has enabled the hotel to reduce its maintenance costs and reduce the use of chemical cleaning agents such as chlorine.

17.4%

of oil saved per day compared to maximum heated system method

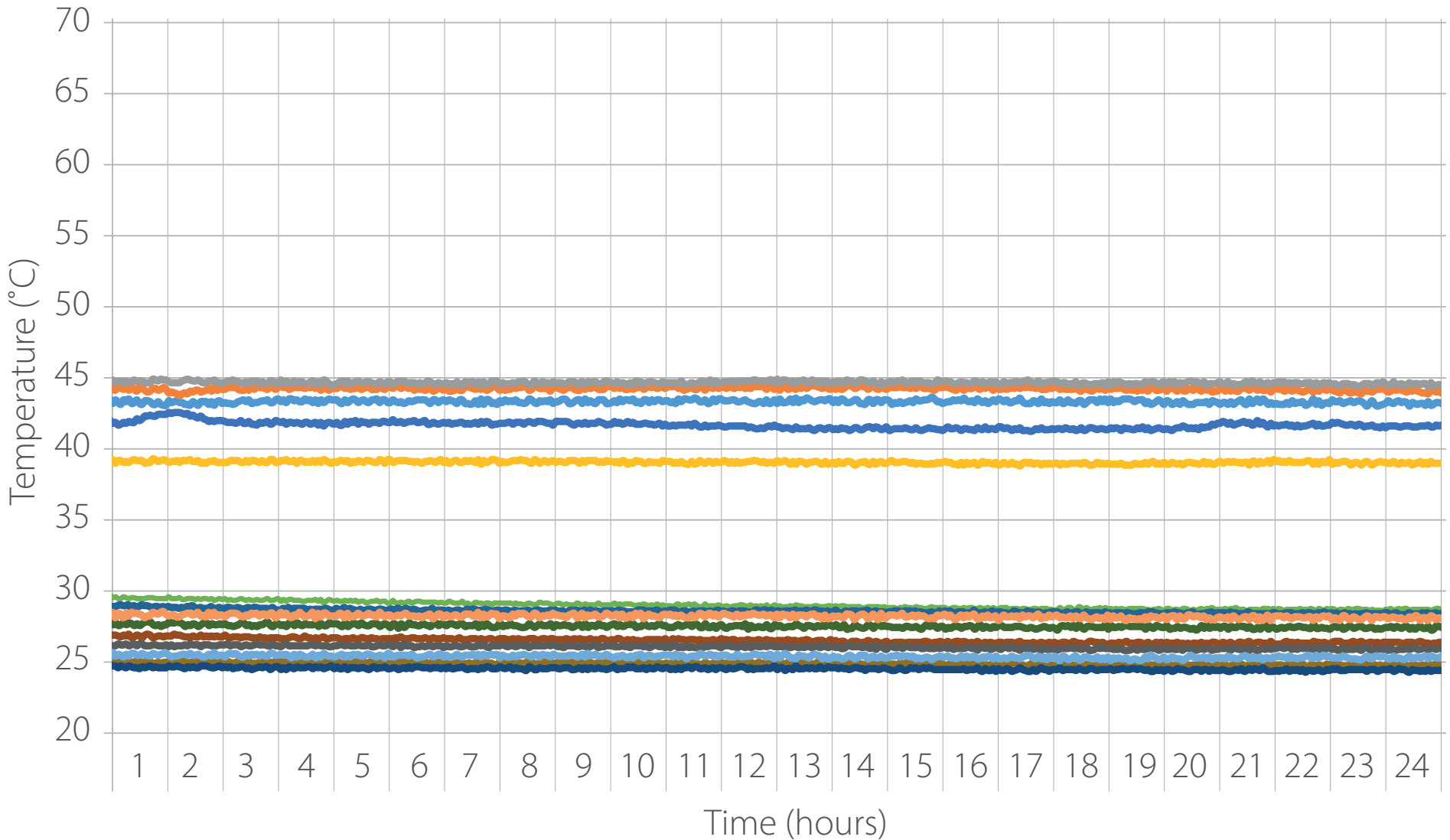
2 year

return on investment

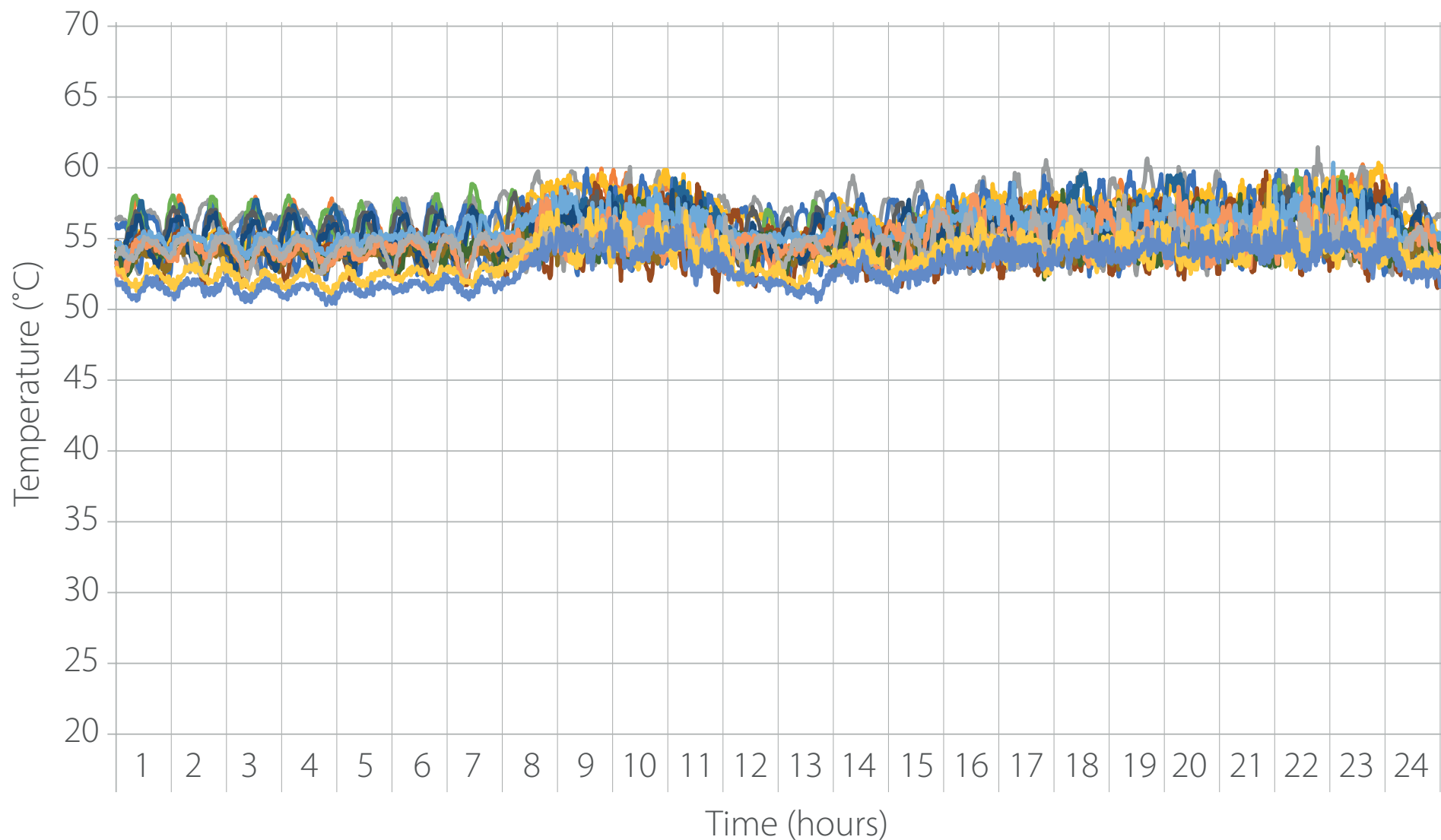
Temperature measured by a certain sensor:

S2 S3 S4 S5 S6
S7 S8 S9 S10 S11
S12 S13 S14 S15 S16

Before the renovation, insufficient flow meant branch temperatures were too low



After the renovation all branch temperatures are above the required level



The implications

After the hotel had successfully implemented the thermal balancing solution with MTCV valves, TWA actuators, temperature sensors, and the CCR2+ electronic controllers, the story continues.

Maistra decided to implement the same solution in some of its other hotels, as well as in sanitary units on its camp sites, all in the Istria region in Croatia.

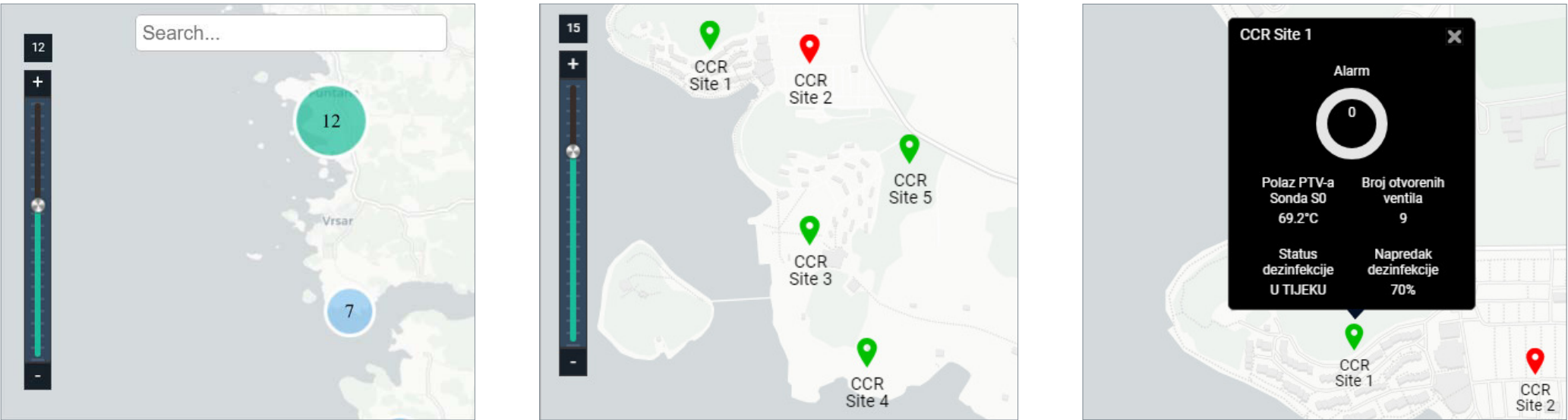
During periodic DHW health inspections by local authorities, the value of having real-time and historic water temperature data became apparent.

“Being able to show health inspectors the current and historic temperature data for the entire system was a huge advantage for us,” said Oliver Fatorić, Head of Technical Maintenance at Maistra Hospitality Group

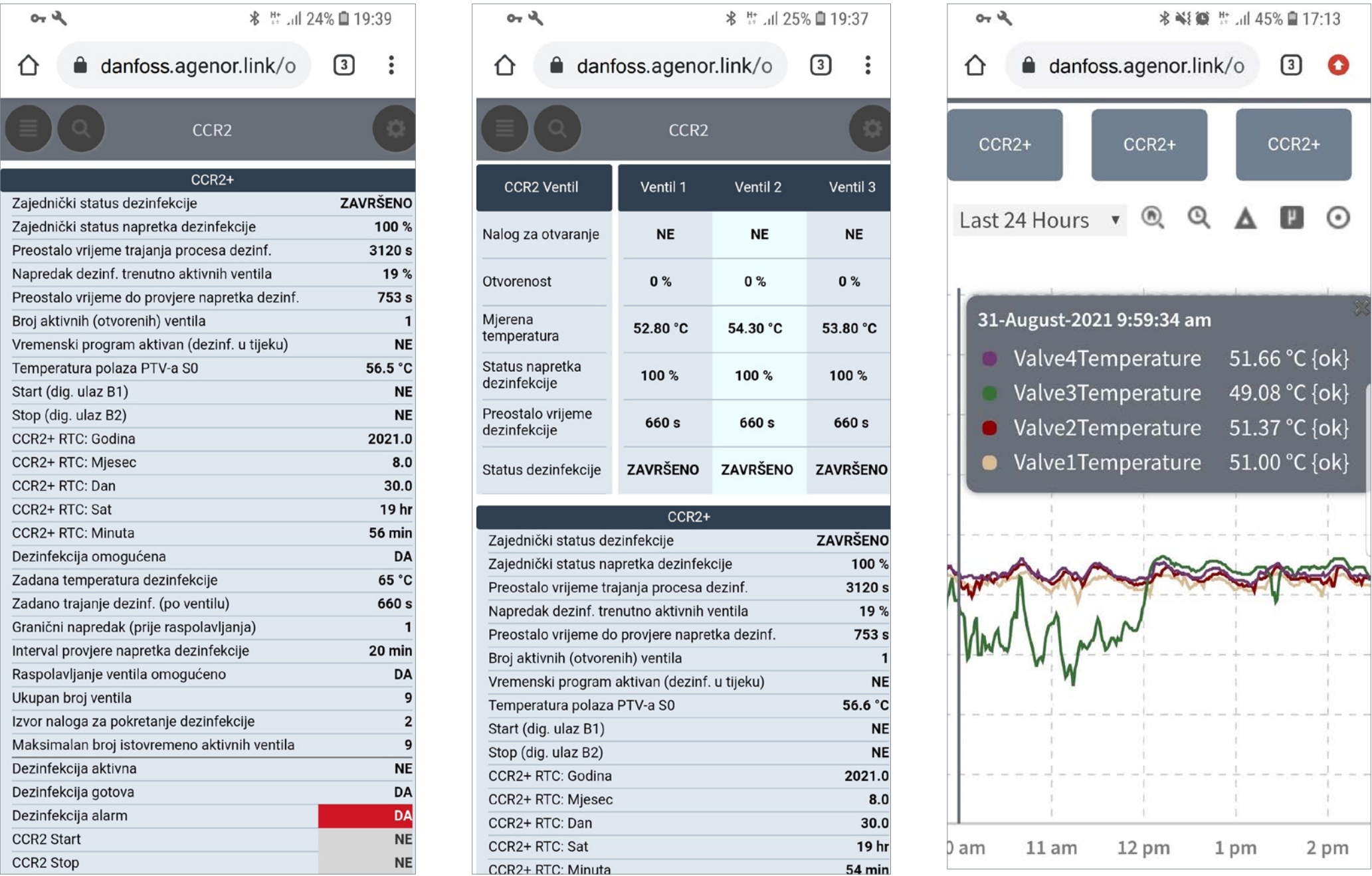
Maistra looked at the technical possibilities the CCR2+ controller offers and decided that the optional connection and integration of all the CCR2+ controllers in one cloud-based control system would optimize services even further. Centralizing the data made it easier to access. All temperatures from all the hotels’ DHW systems are now visible at the touch of a button.

Maistra took this a step further. To serve their different technicians, Maistra worked with a system integrator, Agenor automation, to also include an app. Technicians can now carry valuable information with them. For example, if an alarm is sent during a disinfection cycle, they can check the system from their mobile device.

The cloud-based, centralized DHW control system shows the status of all site locations



The Agenor app shows detailed information on Maistra technicians’ mobile devices



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“Digitalization of our hotel’s DHW system monitoring and control has saved us a lot of time and we are now working a lot more effectively.”

Oliver Fatorić
Head of Technical Maintenance
at Maistra Hospitality Group