



## CASE STUDY

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# Outdoor Cooling Unit in NARI Ultra High Voltage Converter Station

Pfannenberg provides thermal management solution for the new application of preset container in the converter station of the State Grid.

*The preset container well solves the remote installation and commissioning issue for UHVDC converter station but brings a new challenge on the cooling and monitoring.*

*Pfannenberg offers an innovative solution with standard products to serve the container.*

Ultra high voltage direct current (UHVDC) technology means equal or more than  $\pm 800\text{kV}$  direct current transmission technology. Comparing to traditional alternative current electricity transmission technology, the UHVDC could support a longer distance transmission with less power consumption on the way and less land occupied for infrastructure.

Taking the Lingzhou – Shaoxing UHVDC project in China as an example, it connects Lingzhou (Ningxia Province) and Shaoxing (Zhejiang Province) which has more than 1,600 km distance. The total project costs about 10 Billion Euros but gains 60% land saving and reduces 25%~40% power loss in transmission. In order to balance the energy generation and consumption situation, there will be another 52,300 km long UHVDC line construction in the national plan of China.

Pfannenber’s customer, NARI Technology Co., Ltd. (abbr. as NARI) is a leading supplier of solutions for power and automation technologies in China. It stands as top one Power SCADA (Supervisory Control and Data Acquisition) provider in China and also top one smart grid researcher for China State Grid. It supplies DC protection system, DC measurement system, safety and stability system and AC protection system in the UHVDC projects. In order to solve the unexpected assembly and commissioning problem in remote areas on site, NARI has developed the “preset container solution”, in which all the necessary protection and controlling systems can be installed in the cabinet and put into a container in advance. So, all the installation and commissioning could be complete in NARI plant before ex-work. This can be recognized as the game changer in the grid industry.



UHVDC line under construction



Lingzhou – Shaoxing UHVDC line sketch map

The container which has electrical cabinets inside needs to be air conditioned as per NARI's request because the container is located outdoor and exposed to the sunshine, dusts and humid. The system protection needs to be IP55. Communication protocol of RS485 is also mandatory with the central control system to monitor the status of the air conditioner. The heat load of the container is about 10 to 15 kW, where the sunshine exposure contributes a certain part, which means 2 to 3 pcs of cooling units are needed by one container. The whole container needs to be ventilated with fresh air regularly since there is toxic gas generated inside.

It looks like a commercial application because the entire container room needs to be cooled down while the other requirements like communication protocol, high IP protection and fresh but filtered air ventilating are not popularly offered by commercial air conditioner as well as high reliability. Maintenance free is also highly needed since the units will be installed in remote area. This all brings the customer into a dilemma in selection (commercial A/C vs. industrial A/C).

Pfannenber approached the customer, understood the application and prepared a customized solution for this application: outdoor cooling unit DTI 8561 plus 4th gener-

ation IP55 outdoor filterfans. The cooling unit has RS485 communication protocol, robust components for industrial use and can be easily handled for any kind of service (installation, maintenance and repair). The filterfan will be controlled by the timer of the customer to pump fresh and clean air to the container regularly. The integrated condensate management system inside the cooling unit handles the condensation well during operation. The long service interval of the filterfans also reduces the service cost in the future. All of the above contribute to a unique solution to this application.

Pfannenber identified, innovatively and successfully solved the thermal management issue of the preset container of NARI. It also creates good reference for the preset container thermal management when it is popularized in more industries in the future.

For the UHVDC line, normally there is one converter station in each the beginning point and the destination point. So roughly there are 100 converter stations, each of which needs about 10 to 15 pcs cooling units. Therefore the market potential in UHVDC in China is very huge. Pfannenber has delivered 24 pcs cooling units for the two stations in Lingzhou – Shaoxing Line.



Preset container

## Facts at a glance

<b>Task</b>	Develop an industrial solution – outdoor cooling units and filterfans for the preset container in UHVDC converter station
<b>Challenges</b>	High ambient temperature, big cooling capacity, digital communication, maintenance free
<b>Products used</b>	DTI 8561, PF 32.000/65.000, PFA 30.000/60.000
<b>Success factors</b>	<ul style="list-style-type: none"> <li>• Sharp finding and full investigation in new application.</li> <li>• Innovative solution with existing standard products.</li> </ul>

## Summary

UHVDC is a newly-developing market with big potential demand in China, where the preset container comes up and well fits for locating protection equipment. The container can be pre-assembled and commissioned so that a lot of work on site will be eliminated.

The new application requires new solution for thermal management with highly reliability, digital communication, and robustness. Pfannenber innovatively offers a solution with outdoor cooling units and filterfans.