



Johnson Controls Provides Green Heating Solutions by Recovering Waste Heat

By author Terry Deng, Global Product Manager – Thermally Driven Chillers and Heat Pumps, Johnson Controls

“ In 2015, China’s Northern region district heating reached 8.5 billion square meters and consumed heating energy of 185 million metric tons of standard coal equivalent, which almost doubled from 2005 and is still increasing. Coal represents about 90% of the district heating energy consumed in Northern China, or approximately 166 million tons per year, contributing to the serious air pollution in the region. ”

China’s central government identified sustainability as a long term national agenda and strategy to promote waste heat recovery solutions. Northern China has a large industrial base where waste heat energy from these processes could be repurposed to provide usable heat and offset approximately 0.3 billion tons of coal consumption. According to the “Implementation Plan of Providing Residential Heating by Waste Heat” issued by the National Development and Reform Commission, coal based heating systems serving 2 billion square meters will be replaced with low-grade waste heat recovery solutions by the end of 2020. This energy restructuring will reduce coal consumption by more than 50 million tons and is key to improving China’s air quality.

Johnson Controls manufactures the most comprehensive range of heat pumps in China, providing waste heat recovery systems with capacities ranging from 1 to 100 megawatts and offering optimized solutions for diverse operating conditions.

- In coal fired combined heating and power (CHP) plants, steam from power turbines is used to drive heat pumps to recover “waste” heat from power plant cooling water and to produce hot water for district heating. The YORK YDST (steam turbine driven centrifugal heat pump) is specially designed

for large heating capacity applications like CHPs with unit heating capacity range of 20 to 40 megawatts. Absorption heat pumps driven by steam, hot water or direct fired, provide heating capacities from 1 to 40 megawatts.

- In treated sewage water plant and ground surface water (such as river source) applications, heat pumps can absorb low temperature thermal energy from water and provide a heating supply for district energy stations. Compared to traditional gas heating, YORK CYK and YORK OM centrifugal heat pumps and YHAP absorption heat pump can reduce heating operation cost by more than 30% by using low temperature source water, such as 9°C, and providing hot water temperature above 70°C.
- Industries like petro-chemical use cooling towers to produce cooling water for production process cooling. By recovering the thermal energy contained in the cooling water, YORK heat pump solutions can achieve more than 50% heating operation cost savings compared to gas heating solutions (remarks: based on heating COP of 5.7).

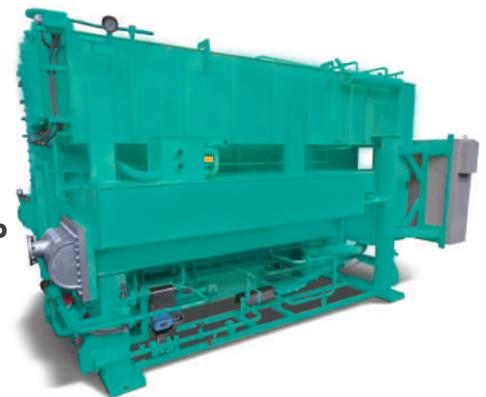
The China Resources Group Tangshan Fengrun Power Plant heat recovery project: The China Resources Group Tangshan Fengrun Power Plant (350 megawatts power turbines) has been in operation since 2014. In 2016, Johnson Controls provided two YORK YDST steam turbine driven heat pumps to recover “waste” heat from the power plant cooling water (22°C) and produce hot water of 64.3°C. The heating COP is 4.74 and the single heat pump unit recovers 21 megawatts of “waste” heat from cooling water. With two YDST units in full operation, Johnson Controls green heating solutions provides 42 megawatts of free heating through heat recovery, which equates to 0.84 Million m² heating area in Tangshan city, Hebei province, China. The YORK

solution saves 14.8 thousand tons of coal consumption and reduces CO₂ emissions by 39.1 thousand tons per heating season.

Johnson Controls provides the most complete product offerings for China's large scale district heating market, including both mechanical and absorption heat pumps. For mechanical heat pumps, motor driven and steam turbine driven solutions are available, depending on the customer's need. For absorption heat pumps, both type I (heat amplifier) and type II (heat transformer) products are available with unique design and outstanding performance.



The YORK YDST Heat Pump



The YORK YHAP Heat Pump

