Pump it up, the heat!

As the energy industry is moving away from fossil fuels, heat pumps will be a key element of the future energy supply of our civilization.

Hydropower, photovoltaics and wind will constitute the major sources of energy in most of the countries. They have great potential to cover a considerable portion of our power demand. But one must not neglect the fact that fulfilling the heat demand for our domestic life as well as for industrial processes is of similar importance.

Reversing the classic thermodynamic cycle for converting heat to power, the heat pump offers the option to provide the required thermal energy at low cost by upgrading low-temperature heat from the environment or from industrial waste heat. There are limits to the achievable outlet temperature, but modern heat pumps have proven to achieve reasonable performance up to approximately 130°C (266 deg F).

Compared to the traditional way of burning fuel in a stand-alone heater or a cogeneration process, heat pumps can produce the same output with a fraction of the primary energy input by tapping into ambient or waste heat sources that are available for free.

Depending on the temperature difference between the heat source and the required supply, heat pumps can multiply the energy input from the electrical or thermal driver by a factor of five and above.

How to find the right heat pump system?

When it comes to industrial applications such as district heating or process heat supply, the heat pump must be selected with proper diligence, and for large applications it may even be an engineered solution. With industrial scale systems, one or several sources of waste heat may be available at temperature levels well above ambient, so that heat pumps can achieve desired supply temperatures at surprisingly low cost.

But finding the optimal solution is actually a quite complex task, as both, supply and demand side must be diligently analysed. Since both typically fluctuate with seasonal changes, time of the day, or production cycles, the optimal solution is very likely to be a combination of generation and storage equipment.

The optimal solution requires a system-wide analysis because it must consider the interplay between source and target and between generation and use.

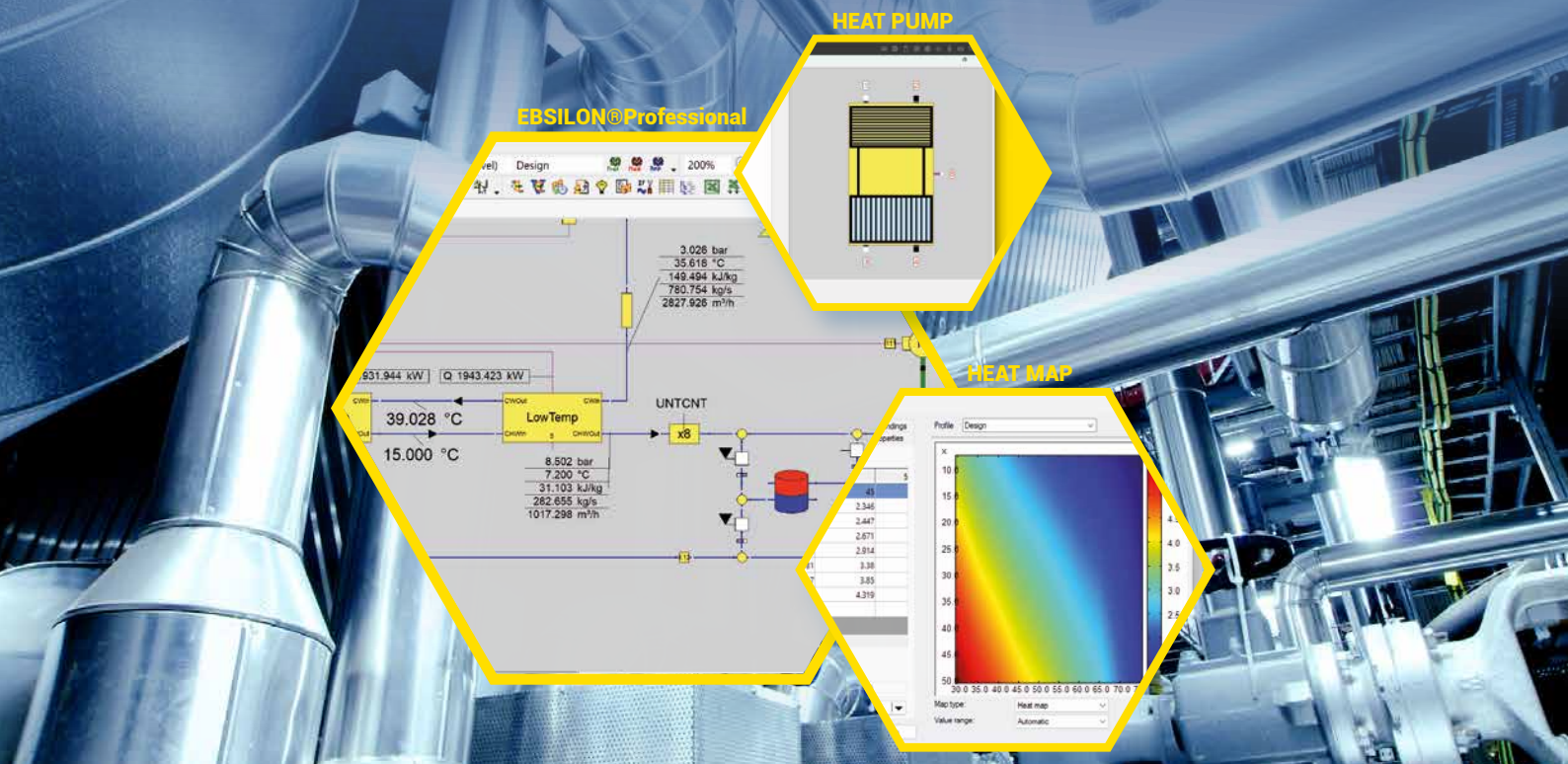
ENEXSA is an Austrian expert company concentrating on consultancy and software systems for the power industry.

We co-develop the EBSILON® Professional heat balance software which covers the entire spectrum of power generation processes from traditional fossil technology to renewables. Industrial heat pumps can be modelled in EBSILON either through the manufacturer's performance curves, or in full physical detail of the thermodynamic cycle including evaporation, compression, condensation, and expansion of the working medium. It is even possible to simulate absorption heat pump cycles. In an EBSILON model, the entire energy conversion process from source(s) to sink(s) can be designed and simulated on both, the equipment and the system level.

Diligent considerations are good, comprehensive simulations are better.

For both, technical and economic decisions, power systems must be simulated with sufficient level of detail and in a very large number of cases that cover the entire range of ambient and operating conditions. For a power system including renewable generators, the evaluation should span the entire year as a minimum. This is the only way you can prove that you have chosen the optimal design.

For more know-how, please contact ENEXSA!



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