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Saving energy with a new approach to pre-heating generators in data centres

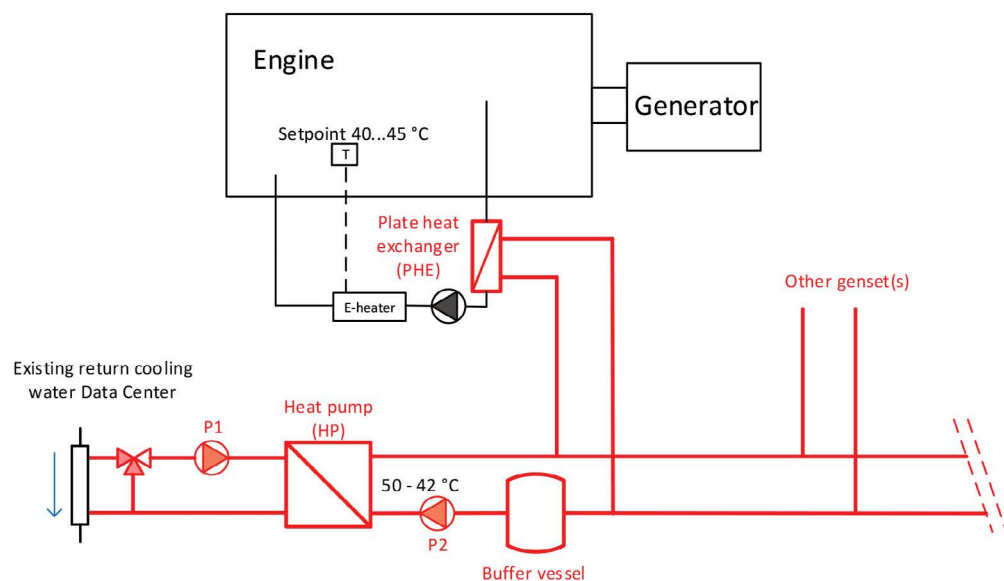
Article

The use of residual heat from a data centre, combined with a heat pump, can provide an effective energy-saving measure for pre-heating generators.

A joint study between Equinix and Royal HaskoningDHV has investigated the technical and financial feasibility of an alternative pre-heating system for back-up generator motors. The study shows it is a viable approach to save energy under particular conditions in existing data centres. The benefits are clear for integrating this system into the design of new data centres. The solution can also be applied in other sectors which rely on multiple back-up generator systems.



Heat pump system for pre-heating generators



Strategic focus on energy reduction at Equinix

Energy efficiency is a strategic imperative for Equinix as part of its sustainability ambitions. For the past 12 years, its programme to cut energy use by at least 2% annually has delivered considerable cost savings and environmental benefits. A recent focus in the programme has been on re-using heat generated within data centres.

One of the areas that requires the application of heat is the back-up generator setup. The engine needs to be maintained at a temperature of 40-50°C to ensure the generator will reliably start the first time - essential due to the mission-critical nature of data centres.

An electrical cooling water heating element operating 24/7 provides this constant warming. While power usage of the element is relatively small, its continuous nature results in significant annual consumption. Insulation is not a solution to reduce consumption because heat needs to dissipate when the generator is in use.

Royal HaskoningDHV highlighted an example where residual heat was being used successfully to warm the engine cooling water in a set-up of 14 generators. It raised the question of whether such a system would be feasible in a location with a smaller number of generators. To discover the answer, a joint research project was established between Royal HaskoningDHV and Equinix to identify the technology needed and the financial viability.

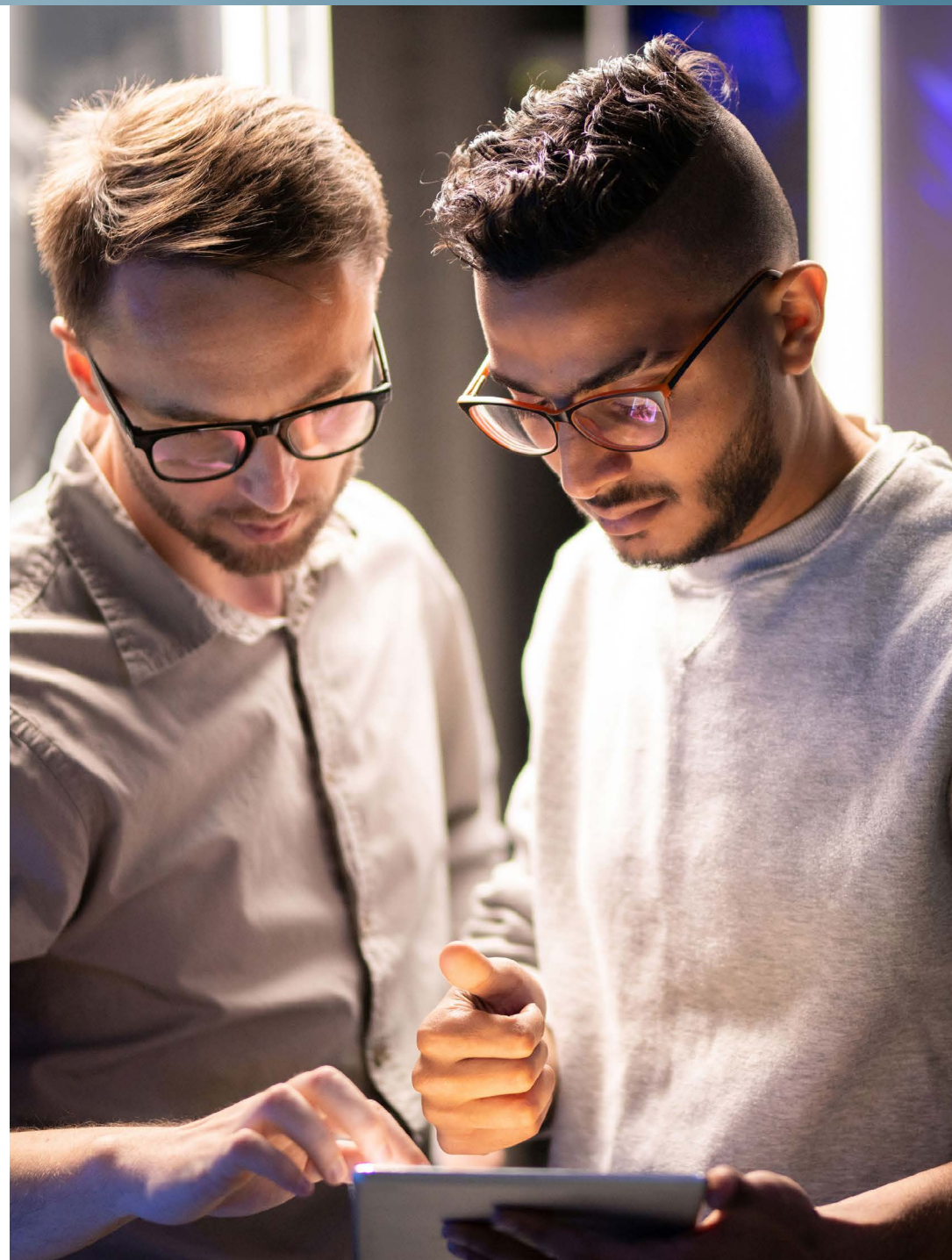
Research explored conditions under which the system is viable

The water cooling systems in data centres typically run at temperatures of between 22 and 32°C, depending on the age of the centre. These temperatures are below what is required by the generator engine, so a water-to-water heat pump is needed in the new system. Calculations by Royal HaskoningDHV indicated the energy required for the heat pump is 3-4 times less than the energy used by the electrical element, representing a significant annual saving. The chilled water from the heat pump will be used to cool the datacentre.

Taking into account the modifications and new equipment required, the investigations showed that, while it is a relatively expensive system when just one generator is involved, it is feasible for multiple generator setups in existing data centres, subject to a number of pre-conditions:

- **To recoup the investment, at least 6 generators at 4kW pre-heating each must be connected via the heat pump installation.**
- **The shorter the pipes between the heat exchange point and the generators, the more favourable the investment.**
- **A heat pump with trouble-free installation life of at least 15 years with minimal maintenance is needed.**
- **The supplier of the generator needs to agree to the modifications if guarantees are to be maintained.**

The investigations also indicated that it is an excellent energy-saving measure for new data centres - and in other sectors relying on emergency power systems such as hospitals, airports and industry.



Financial feasibility models indicate potential payback periods of less than 5 years

Modelling explored the financial viability of the system in existing data centres and identified that a payback time of less than 5 years is feasible with 6 generator sets or more (each 4 kW pre-heating) and when the distance to the chilled-water-return connection is limited. Subsidies may be available which can increase feasibility, but these need to be considered on a case-by-case basis.

The distance between generator sets and the coupling point has a major impact on payback time, so it is important this is taken into account when designing new data centres.

In view of the promising nature of the system, Equinix intends to set up a pilot project to verify the numbers from the study.

Would you like to discuss your ideas?
Please get in touch with:



Hans Schelvis
Principal Engineer
Mechanical Netherlands
Equinix

+31 (0)6 25 15 42 83,
hans.schelvis@eu.equinix.com



Paul Schmidt
Project Manager
Royal HaskoningDHV

+31 (0)6 11 39 89 33,
paul.schmidt@rhdhv.com



Ben van Herwijnen
Sr. Mechanical Engineer
Royal HaskoningDHV

+31 (0)6 50 74 06 18,
ben.van.herwijnen@rhdhv.com