

# Europe Must Harness Waste Heat to Be More Competitive: Q&A



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Europe's manufacturers must recover and use waste heat to improve their competitiveness, according to Turboden, an Italy-based unit of Mitsubishi Heavy Industries that makes turbines driven by organic fluid and gases instead of water and steam.

The benefits "include improving our long-term industrial competitiveness, improving environmental sustainability, thanks to emission reductions, the development of local supply chains and innovation, and job creation," Chief Executive Officer Paolo Bertuzzi said in an interview.

Turboden is working on projects that recover heat from gas compression stations and from gas flaring, although most oil & gas companies do not have emission reductions on this scale within their priorities, Bertuzzi said. If they were subjected to carbon emission costs, that would transform the market, as would changes in regulations that limit the ability of gas companies to sell any power

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China has been building waste-heat recovery plants at industrial sites at the rate of 80 a year for the past decade, compared with just 30 such plants overall in Europe so far, according to Bertuzzi. The company is considering offering heat recovery installations on a build-own-operate basis to get around some of the limitations that hinder growth.

The interview below has been edited for length.

**Q: Turboden produces turbines that use organic fluids and gases rather than water and steam to convert heat into energy, so-called Organic Rankine Cycle turbines. What are their applications and where is the market for this technology?**

**A:** The ORC system vaporizes an organic fluid, characterized by a molecular mass higher than that of water, which means the turbines have a slower rotation, lower pressures and no erosion of the metal parts and blades. Otherwise they work in the same way as a conventional steam turbine. Our ORC systems can generate electric and thermal power from multiple sources, such as from biomass, geothermal energy, solar energy, as well as from traditional fuels, and can be used in waste-heat recovery from industrial processes and waste incinerators. It is an efficient, clean and reliable way of producing electricity.

**Q: How has the market for turbines for renewables evolved in recent years?**

**A:** In the past, our business was mainly focused on biomass projects – some 70 percent of projects were in biomass, 15 percent was waste-heat recovery and 15 percent was geothermal. Recently, on the contrary, we developed a larger solution that is more suitable for waste-heat recovery and a specific solution for geothermal – so our order book now stands at 40 percent geothermal, 30 percent biomass and 30 percent waste-heat recovery. In addition to this, the stream of revenue from new services is growing. Traditionally, our after-sales revenue was less than 10 percent, now it is about 15 percent and it will grow to 20 percent soon – we offer advanced remote diagnostics and operation along with traditional after-sales activities such as maintenance.

**Q: Renewables have required subsidies and other forms of support to reach their current footprint. What support mechanisms does this technology benefit from at the moment? What barriers are there to growth?**

**A:** Regarding heat recovery, in Italy we have the White Certificates scheme. This specifically includes ORC technology and rewards the additional energy savings stemming from the investment in energy

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30 for industrial heat, across all energy-intensive sectors. This is compared to China, where more than 800 waste-heat-to-power systems have been installed in less than 10 years in cement factories, using traditional steam technology, according to the World Bank.

These plants require capital-intensive investment, so a payback period of more than five years, which is one barrier. Also, we are up against a non-coherent EU policy framework, discounts on industrial energy bills that are not linked to investment in energy efficiency, and a lack of knowledge of the ORC technology. Waste-heat recovery systems therefore need adequate support in order to overcome these barriers. If we get this right, the benefits include improving our long-term industrial competitiveness, improving environmental sustainability, thanks to emissions reductions, the development of local supply chains and innovation, and job creation.

**Q: One of the new markets for you is in oil and gas, where you have already completed two ORC installations and have another two under construction. Can you explain what these projects are and why they are important?**

**A:** We currently have two projects in operation, one in Russia and one in Canada, and two further projects in Uzbekistan under construction; one of them is going to be commissioned before the end of 2018. The two in Uzbekistan are quite small – so in the range of 1-2MW, they are almost demonstration projects and the relative capex is quite high. The payback of these projects is long, maybe eight years. But in the oil and gas business there is great scope for projects within the range of 5-15MW, this is the real commercial size for these projects. In fact, the second one in Uzbekistan and others we have under discussion in Russia and other countries, are in this range.

The Canadian project and the two in Uzbekistan are heat recovery projects in gas compressor stations. Typically in these stations, gas turbines are used to drive the compressors that pump the natural gas in the pipelines. Essentially, our projects improve the energy efficiency of these stations by exploiting the waste heat contained in the exhausts of the gas turbines to produce useful power. This is done either through mechanical power to partially substitute or to improve the compression capacity of the station, or we generate electricity to cover the station consumption and/or to be sold to the electrical grid.

The Russian project is a flare-gas exploitation project, where our ORC turbo-generator, coupled with a special boiler, exploits the flare gas instead of flaring it. Specifically, the system produces electricity and hot water used by the O&G facility.

These projects are particularly important because all of them improve the sustainability of our O&G customers, a key priority for the sector at

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real interest in implementing energy-efficient solutions because, even though the potential in terms of CO2 reductions is very big, today they don't have a real commitment to make these cuts. The solutions are available, payback in acceptable, from 5 to 7 years, but the implementation of what for them are small projects is not at the top of their priorities.

These companies are used to managing large projects like new pipelines or gas compression plants, so these projects, even if they are feasible, are not material unless they are required to implement some obligation. The decision process and the procurement procedures in these large companies are so complicated that, if something is not mandatory they do not go through.

One alternative we are thinking about, is proposing these projects on a build-own-operate basis. This would not be so easy in remote countries, but one way of simplifying the decision-making process is to offer this with proper terms.

**Q: What are the regulatory barriers to gas producers using heat recovery for power generation, and what needs to happen for the gas industry to make better use of waste heat?**

**A:** Almost all the gas transportation companies in Europe, and also in some other parts of the world, are not allowed to sell electricity by law. Therefore, the exploitation of waste heat for electricity generation has to be limited to cover the consumption of the facilities where waste heat is produced. This limits the size of these projects, making them frequently not cost-effective. This should be changed to permit these companies to invest in energy-efficiency projects.

In general, apart for this specific situation, these waste-heat recovery projects are seen as a secondary topic by most of the O&G companies, mainly because the production of fuel free power is not a direct benefit for them. Consequently, it is difficult to develop these projects - a good instrument for changing this could be the emission trading schemes, if they are properly applied also to the O&G companies.

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