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Press Release

DEPRAG provides information about the application of GET turbine generators

Utilizing potential: converting waste energy into power

Cooperation project partners develop ORC research power generator

There are many weapons in the fight against climate change. One is the use of renewable energy. Another important element is the recovery of waste energy which is released by countless industrial processes. Unfortunately, it is often just lost into the atmosphere...

“In many industrial activities process, gas is lost into the atmosphere. The original plan was to find a way to utilize the potential of these gases”, explains DEPRAG Chief Operating Officer Dr.-Ing. Rolf Pfeiffer. The recovery of energy from process gases is not a new idea. “What is new, however, is that with our development, using a small, compact, decentralized energy recovery system, even small amounts of residual energy in the power range of 5 to 200 kilowatts can be converted into power”. The DEPRAG GET turbine generator can be used anywhere that surplus energy is created by industrial processes.

The University of Bayreuth, the East Bavarian Technical College Amberg-Weiden (OTH) and the company DEPRAG SCHULZ GMBH & CO. began a joint research project in 2011 supported by the Bavarian Research Foundation. The aim of the research was to find a use for surplus energy. The project partners have succeeded in efficiently converting existing waste heat into electrical energy

If the surplus energy potential is in the form of heat instead of pressure, it can only be utilized via a special closed-loop method – for example, an ORC process (Organic Rankine Cycle). On this basis, the three project partners developed an ORC test facility which has been installed and tested at the Centre for Energy Technologies (ZET) at the University of Bayreuth. A second research project (2015-2016), in collaboration with the Centre of Excellence for combined heat and power generation (KoKWK)), enabled the partners to optimize the system as well as the turbine generator supplied by DEPRAG so that efficiency was again significantly increased.

Together with the other cooperation partners, DEPRAG organized a customer information event at the University of Bayreuth in order to present the research results. On the day, participants had a unique opportunity to experience the ORC power generator live, become familiar with the processes and find out more about the integrated GET turbine generator.

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The DEPRAG GET turbine generator

A compact unit consisting of a micro-expansion turbine with an electric generator generating power from gas. Without its electric control cabinet, the turbine generator is not much larger than a shoebox and can be installed wherever gas is transferred from a higher to a lower pressure level. The pressure energy released by this shift is only utilized in the rarest cases and therefore valuable energy potential is being wasted.

The innovative GET turbine generator converts the energy contained in the working fluid into power. Gas flows into the turbine, is “compressed” by jets, accelerated, comes into contact with the turbine wheel and releases energy. The kinetic energy is converted into electric energy in the generator. In this innovative system, the turbine and electric generator constitute a compact unit – they share a common shaft. Consequently: When the turbine turns, the rotor of the generator also turns.

The DEPRAG GET turbine generator is available in sizes 5 kW, 30 kW, 60 kW, 120 kW and 175 kW and is individually configured to each process requirement. It is necessary to define the specific processing parameters for the fluid mechanic layout and design of each turbine generator: type of medium, inlet pressure, outlet pressure, mass flow, inlet and outlet temperature. The specialists at DEPRAG also require a precise description of the application and processing conditions.

The specially developed turbine calculation model aids engineers in the design. The tool is linked to a material database to determine the fluid properties of various working fluids at certain operating points. Furthermore, loss models are integrated into the software which has been validated by measurement readings. Therefore, it is possible to precisely determine the geometry of the flow conducting components. The calculation tool has continually been adjusted and improved so that the performance data can be quickly and efficiently determined. This means that there is a considerable reduction in time and costs for the customer. The turbine calculation model not only enables flow mechanic designs from single step axial turbines, it can also be used to calculate two-step axial turbines, so-called Curtis turbines, as well as cantilever turbines.

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The multitude of application areas

The GET turbine generator can be used in both open and closed processes. It can be designed for use with diverse mediums such as compressed air, natural gas, CO2, nitrogen, cyclopentane, or cooling agents such as R245fa, R134a or similar. In the ORC-test system in Bayreuth for example, MM from the siloxane group is vaporized. Dr.-Ing. Rolf Pfeiffer: “Our energy recovery system is suitable for use in a multitude of applications to convert direct process gas into energy or by integrating our GET unit into an ORC process indirectly to utilize unused surplus heat.

Energy recovery using the DEPRAG turbine generator is appropriate for use in many application areas. When transporting natural gas over thousands of kilometers there are numerous application options for GET solutions. One particular challenge has been compliance with the high specifications for EX-protection and diverse approval regulations. These directives were fulfilled for the first time in 2017. The Green Energy Turbine can be used, for example in public utility gas distribution stations: The gas is compressed to a lower pressure level after being transported through pipelines. The expander converts the valuable energy produced when pressure is transformed, into electrical power.

Thermal energy can also occur naturally (geothermal energy). The heat from the thermal water, available free of charge which arises from deep within the earth at 100 – 180°C, is fed into heat exchangers in the ORC cycle. The residual heat is usually fed into a district heating network before the thermal water is returned to the earth via another drill hole.

Thermal sources from stationary applications (CHPs, ship engines) can also be used in an ORC process. Basically, any combustion engine is suitable for additional use with a turbine. Even a very efficient combustion engine can only convert around a third of the energy from its fuel into mechanical work. The remaining 60 percent may be lost as waste heat into the exhaust or cooling water. One approach is the utilization of this thermal energy in a cycle process. The turbine generator plays a key role in this. Other consumers can be supplied with this recovered electrical power and the total degree of efficiency is radically improved.

DEPRAG SCHULZ GMBH u. CO. is one of the market leaders in the manufacture of air motors. Based on the development and production of a wide variety of pneumatic drives over the past decade, they have expanded their expertise into the new field of turbine technology. Their innovative solutions can now be applied to an entirely new range of applications. DEPRAG, based in Amberg, Germany has around 700 employees in over 50 countries. Innovation and the continuous advancement of their existing product lines have meant that DEPRAG is always ready with a solution to the latest challenges of the market.

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