

Steam Let-Down Expander Power Generation System How it works



C2 Technology's

Steam Let-Down Expander (SLDE)

power generation system is for businesses with a steam distribution network. SLDE power generation system can help them reduce their energy bills or even sell electricity to the grid, minimise their carbon footprint and improve their operational efficiency.

How Does a Steam Let-Down Expander Power Generating System Work?

The core of the C2 Technology **SLDE** power generating system is a backpressure turbogenerator that expands high pressure saturated or super-heated steam. Shaft power is produced when a nozzle directs jets of high-pressure steam through a highly efficient condensing radial steam turbine. The turbine is integrated in one casing and directly attached to a rotor of a permanent magnet electrical generator. The power and control subsystems transform the generated electrical energy into a grid compliant form.

The steam turbine does not consume the steam, it simply reduces the pressure that is subsequently exhausted downstream of the pressure reducing valve for distribution to the consumer units. Thermodynamically, the steam turbine behaves the same way that it would in a conventional Rankine-cycle power plant, achieving isentropic efficiency greater than 65%, which is well in excess of the average electricity grid generating efficiency.

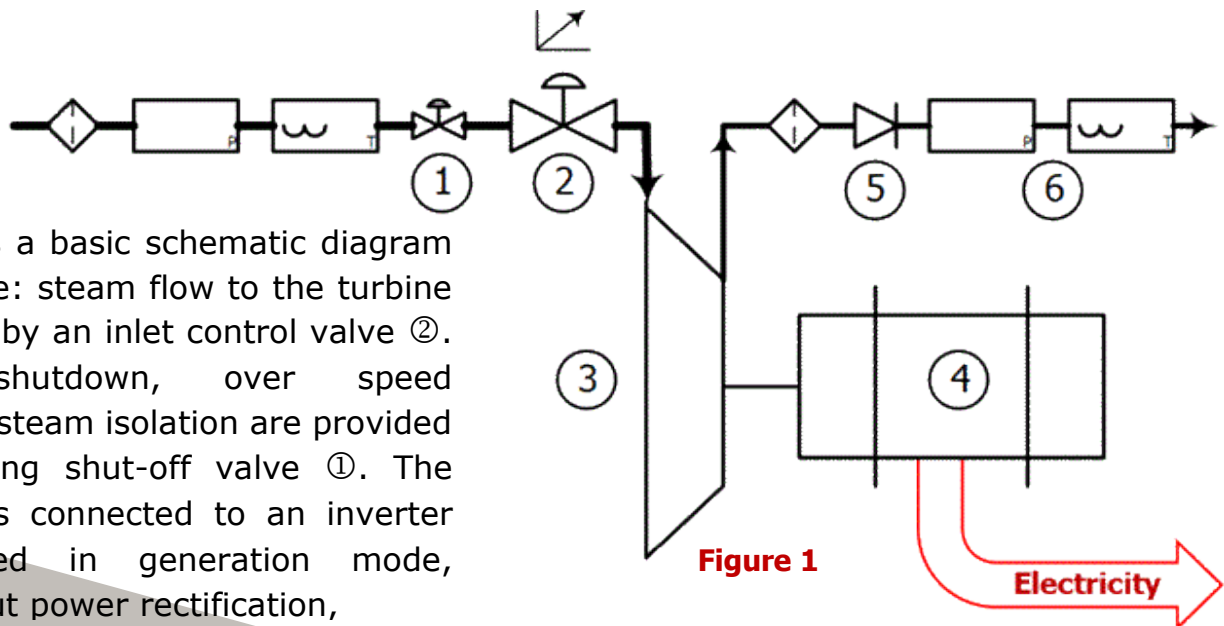


Figure 1 shows a basic schematic diagram for the machine: steam flow to the turbine ③ is regulated by an inlet control valve ②. Emergency shutdown, over speed protection and steam isolation are provided by a fast acting shut-off valve ①. The generator ④ is connected to an inverter drive, operated in generation mode, providing output power rectification,

monitoring functions and speed control. Outlet of the **SLDE** is protected by a non-return valve ⑤. The **SLDE's** control system monitors the operation via instrumentation ⑥: pressure and temperature gauges located at both inlet and outlet of the system.

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With reference to Figure 2, the rectified output of the inverter is connected to an active front end inverter (AFE) which has the sole purpose of inverting available DC power from the inverter to an output matched and synchronised to the electricity grid. The AFE inverter also offers functions to export electricity into the grid. The package was designed for connecting to a non-island

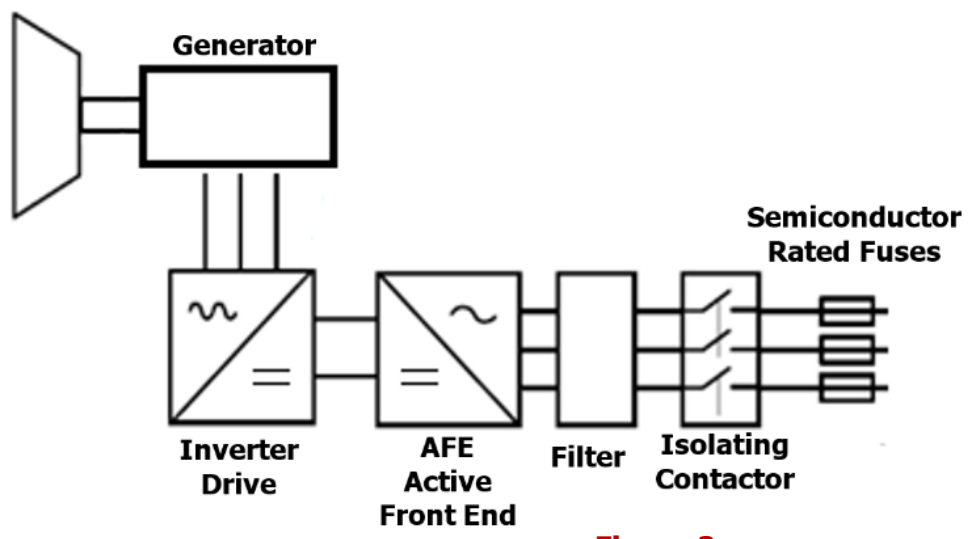


Figure 2

power grid system. That is a system that is connected either to the national or local electricity grid.

Potential Example Application

Figure 3 shows a T-s diagram for a typical **SLDE** application. For a case with the steam operating pressure of 16barg (saturated, point A in the T-s diagram) upstream of the pressure reduction station and 4 barg downstream of the PRS (point B in the T-s diagram) and steam mass flow of 0.55kg/s (1980kg/h) it is possible to generate 75kWe. This load case will have a quality of steam equal to 0.94 at the discharge of the SLDE.

For the case with superheated steam inlet (point D in the T-s diagram) and the quality of steam at the outlet equal to 1 (point E in the T-s diagram) it is possible to generate 75kWe for steam mass flow of 0.5kg/s (1796kg/h), however, this case would require an additional heat input of 77.5kW. Point C in the T-s diagram indicates the outlet of a standard PRS.

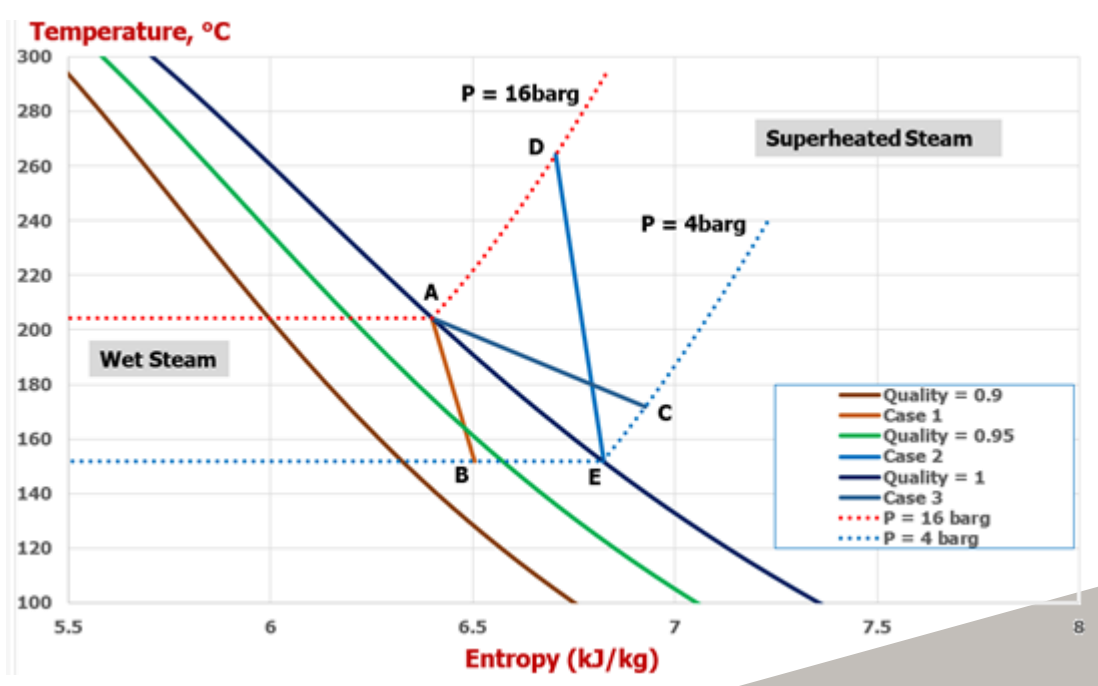


Figure 3

How Can I Get a C2 Technology Steam Let-Down Expander?

C2 Technology supports each installation by a full set of expert services starting with a thorough analysis of the site and calculations of the projected savings from an **SLDE** installation.

To arrange a free consultation call or email us.

Please visit our website or email us for more information

C2 Technology Is Your Partner for Smart & Eco-friendly Solutions Bringing Tomorrow's Technology into Today