Current Experience with the Euler Turbine

Energent develops new energy technology, including new power cycles and new types of turbo machinery. One of the first new turbines developed was the patented Euler turbine. This turbine has several advantages including high efficiency, high reliability and tolerance to liquids and solids.

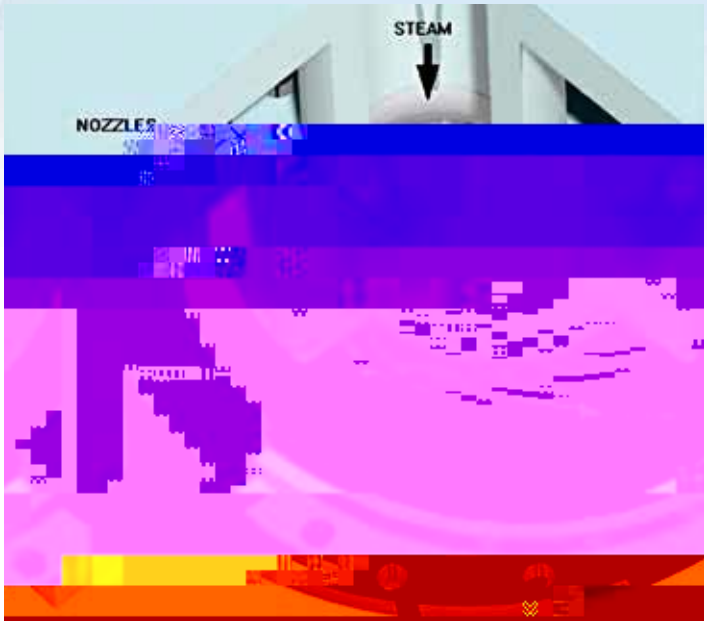

Figure 1 Microsteam Operation

The basic principles of the Euler turbine are illustrated in Figure 1. The flow enters the center of the turbine and flows radially outward. The fluid is expanded through a nozzle row to a high velocity, driving a turbine rotor surrounding the nozzles, and subsequently exits through an annular diffuser. The use of two expansion stages results in high efficiency. Unlike radial inflow expanders, the radially outward flow enables the turbine to clear any solid debris or liquids from the interface between the nozzles and the rotor. Another advantage is that the blades are very rugged and not susceptible to vibrations or breakage as is a common problem in some radial inflow machinery.

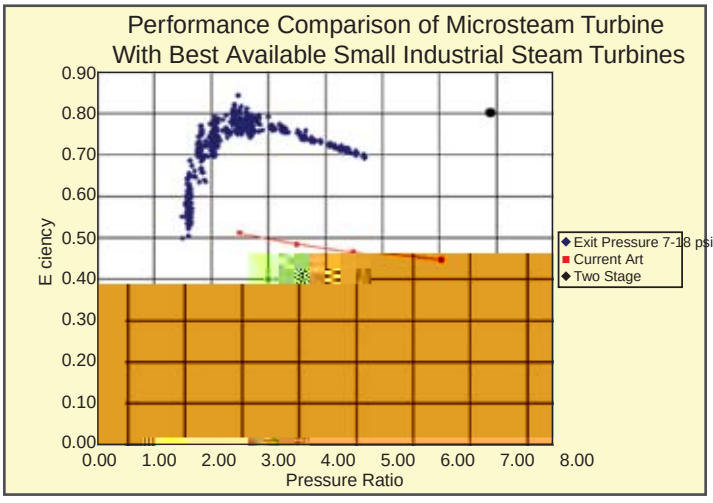

Figure 2 Performance Comparison

The first application of the Euler turbine is known as the Microsteam® turbine. This power system has a rating of 275 kW. The application is to convert wasted steam pressure energy to useful power. Among industrial steam turbines, the Microsteam® turbine is unique in achieving a very high efficiency. Figure 2 shows measured test results of the efficiency versus the pressure ratio across the Microsteam® turbine for tests at the United Technologies Research Laboratory. As shown, efficiency peaks at 80% which can be compared to efficiencies in the 45-50% range for conventional industrial back-pressure steam turbines in this size range. Also shown is efficiency of a two-stage Microsteam® turbine which extends the high efficiency values to a higher pressure ratio.

Figure 3 Microsteam Rotor

The rugged blades shown in Figure 3 are constructed from titanium alloy. The blades are very strong and are not susceptible to resonance-producing vibrations. An example of an installation at Con Edison in New York City is shown in Figure 4. The unit was designed with a vertical axis and a compact 34” width to enable installation through a standard doorway. The controls, electric switch gear and lube oil system are all mounted on one skid providing a complete factory built power system. This power system can operate unattended and has an automatic start and shut down.

Figure 4 Microsteam 275 kW Con Edison Unit

Currently the aggregated operating time for the several Microsteam® power systems that have been sold is 150,000 hours. They have produced more than 30,000 megawatt hours of useful power from previously wasted pressure energy. The successful application to steam led to other applications.