Flexibility – Blessing and Curse for Gas Turbines

Just because you can doesn't necessarily mean you have to, but since most other generation technologies are much less flexible, gas turbines typically must pick up the leftovers from the market.

During the past decades, gas turbines have proven to be a reliable and efficient technology with short implementation cycle from concept to start-up, and with a wide variety of applications covering stand-by peaking, combined cycle power generation, industrial power and steam, and district heating/cooling. Due to their fast ramp rates and wide load ranges, gas turbines can effectively fill the gap in case of demand fluctuations or intermittent generation from renewables. In the current transition of the power industry, gas turbines have also been identified as the bridging technology from the fossil era to a sustainable future, because their traditional fuel natural gas is less CO2-intensive in general, and it may be replaced by hydrogen or other carbon-free gases which are currently investigated as options for mid- and long-term storage of renewable energy.

Fuel and operating flexibility are great advantages, but they are also difficult to understand and predict.

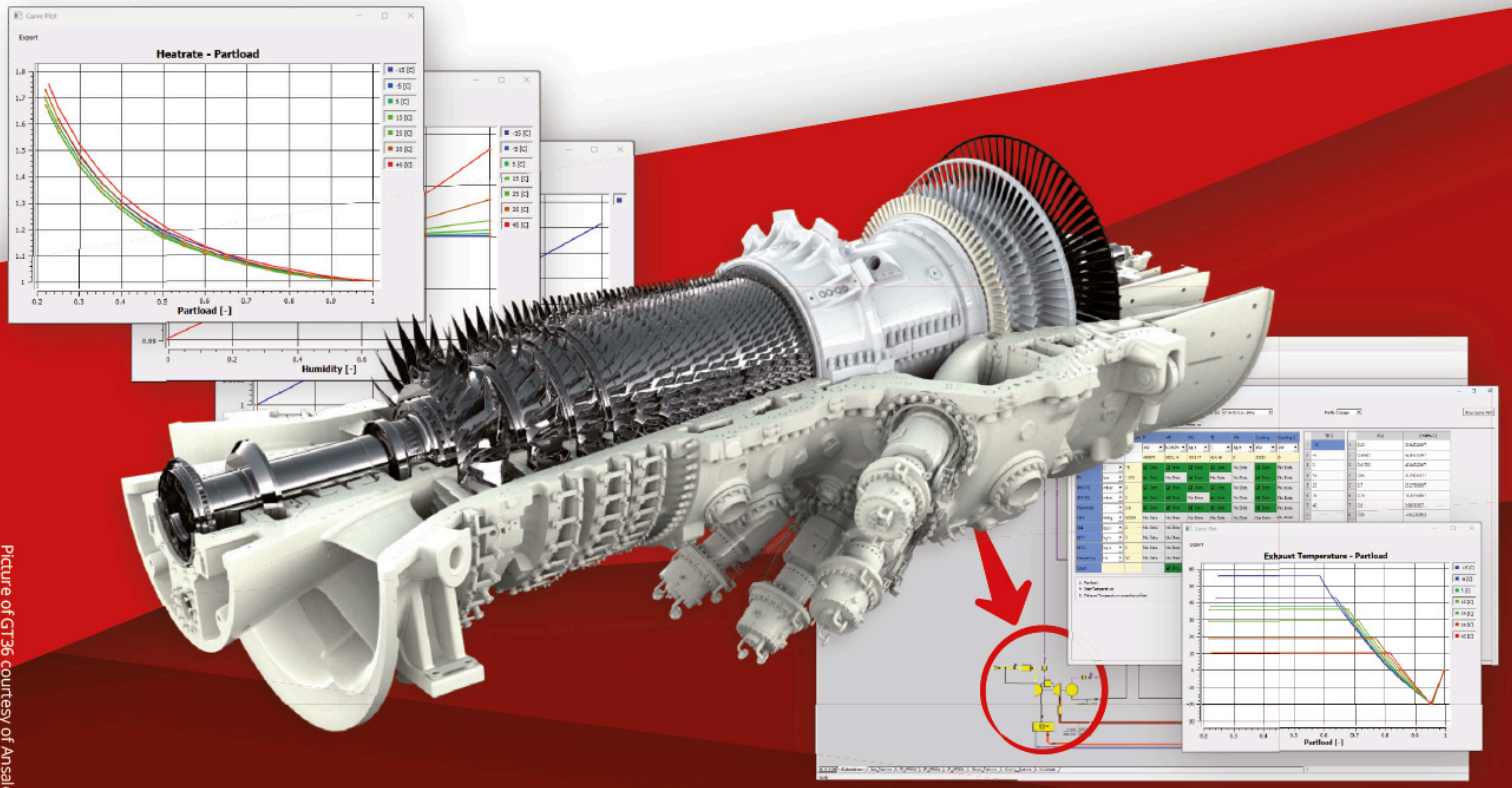
Since the compression and expansion processes inside the gas turbine are very much depending on the conditions at their connecting points to the ambient, and because modern control systems apply a variety of measures to keep the processes at maximum efficiency while mitigating excessive pollutant emissions and unnecessary wear on materials, power output, heat rate, exhaust flow and temperature as well as available cooling duties become complex functions of many parameters. When burning high fractions of H2, its significantly different flame dynamics as well as other 'eccentric' combustion properties require specific control measures that also affect overall performance, and likewise occurs when burning other non-standard fuels such as blast furnace gases.

If you can't know the inside, you must go with the outside.

Since technical details and individual control philosophies are not disclosed by the OEM and much too complex to reverse-engineer, the only reasonable approach is the 'black box' and to describe the performance characteristics of a gas turbine with a specific fuel with a comprehensive set of correction curves. ENEXSA's Gas Turbine Library add-on for EBSILON®Professional contains detailed data sets derived from OEM simulation tools or vendor-supplied information.

- up to 69 individual correction curves including part load performance,
- editable and adjustable to project specific data or test results,
- fully integrated into the EBSILON heat balance software
- currently including more than a thousand data sets from all major OEM.

If you want to learn more about the Gas Turbine Library for EBSILON, please contact ENEXSA!



Picture of GT36 courtesy of Ansaldo Energia

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