

Ansaldo Energia extends capability to burn low-Btu fuels with combustion system upgrade

As the price of natural gas continues to climb globally, it behooves electricity producers to burn, whenever possible, more economical alternative fuels in their gas-turbine-based powerplants. They include low-Btu fuels produced by the gasification of tar, coal, coke, and biomass; off-gases from steel and other processes; and high-hydrogen-content fuels from natural-gas reforming activities.

There are no pipeline networks to supply these fuels, which are very different in composition from natural gas, and usually from each other, and typically are of low heating value. This means they must be burned where produced. In the case of byproduct fuels, close cooperation between the supplier and electricity producer is required to ensure reliable GT operation in the event of process upsets.

Many different process gases can be burned in GTs, but their use is not a straight substitution for natural gas. Fuel supply and combustion systems designed for pipeline gas must be modified to accommodate low-quality fuels. In some cases, the job is made more complex by the need to burn blended gases or have the ability to fire natural gas when the process fuel is not available. Startup on syngas may be yet another operational goal.

There are relatively few companies worldwide with the technology and experience to modify existing engines—or build new GTs—to burn process or coal-derived gas. Ansaldo Energia is one of these. A review of the company's work over the last decade in the combustion of low-Btu fuels was presented at Power-Gen Europe last spring in Cologne by P Gobbo and F Bonzani. The title of their paper was "Upgrading of V94.2K Combustion System."

Most recently, Ansaldo Energia delivered an E-class V94.2K engine for Ferrera Erbognone's integrated gasification/combined cycle (IGCC) powerplant. It was designed to burn a low-Btu gas produced from tar at an Eni Group refinery using Shell technology. The single-shaft GT has a cold-end drive and two silo-type combustors arranged vertically on either side of the turbine. Each combustion chamber has eight separate burners equipped for burn-

ing low-Btu gas as the primary fuel and natural gas as a backup.

Nominal base-load power at ISO conditions is a nominal 167 MW, efficiency is more than 36%. Guaranteed emissions profile in units of mg/Nm³: NO_x, less than 50; CO, less than 25; particulates, less than 10.

Modifications made to the standard engine to burn the byproduct fuel are the following:

- Compressor. Added a stage to increase gas flow to the turbine.
- Burner. Redesigned to accommodate the fuel's unique physical and chemical properties.
- Fuel skid. Redesigned to meet operating requirements.

One of the challenges Ansaldo engineers faced on this project was that the composition of the syngas varies with the way the refinery is operated. To illustrate: Raw syngas contains about 45% hydrogen, 49% CO, and 0.6% methane. After some hydrogen is removed for refinery use, the gas is about 33.5% H₂, 61% CO, 0.3% CH₄. However, this composition does not have sufficient energy content to power the combined cycle over the load range required; steam dilution and mixing with pipeline-quality gas produce a satisfactory fuel. It contains 15.6% H₂, 28.5% CO, and 4.6% CH₄ when the gasifier operates at base load. Fuel composition changes as gasifier output drops below base load.

Burner design is based on the syngas burner Ansaldo Energia developed for the V94.2K machines in service at both ISAB Energy, Priolo Gargallo and Elettra Gt, Servola. First, in service since 1998, produces 521 MW while operating on 100% syngas produced by the gasification of tar (Texaco process). Latter, rated 180 MW, began operating in 2000 on a mixture of natural gas and byproduct gas from a steelworks.

Both the ISAB and Elettra burners have logged thousands of hours of successful operation on syngas. However, the significant differences between the ISAB and Elettra and Ferrera Erbognone fuels, plus the possible variability in composition of the new fuel as mentioned above, required a redesign of the existing syngas nozzle. The new nozzle

was tested in separate programs in the Ansaldo Caldaie and ENEL/Sesta Combustion Centers in Italy.

The Ansaldo Energia paper gives details of the company's latest nozzle design for low-Btu fuels as well as the results of combustion tests—complete with data tables and plots of significant variables. Flame stability, emissions and so-called change-over tests (going from natural gas to syngas/natural gas mixture, to 100% syngas, and back to natural gas) are profiled. Finally, test-rig results simulating engine startup directly with syngas also are presented.

To obtain a copy of the complete paper, e-mail the COMBINED CYCLE Journal at bob@psimedia.info.

End-prep tool compensates for out-of-round pipe

ESCO Tool, Medfield Mass, adds to its line of robust Millhog® equipment a portable, air-powered end-prep tool that can compound-bevel large-diameter pipe made of stainless steel, super duplex, and other difficult-to-machine alloys (www.escotool.com).

The Dictator 24 clamps to the pipe ID and compensates for out-of-round pipe with a center-cage mounting sleeve complete with dial indicator that establishes the pipe's actual center. Tool, which can be purchased or rented, features a ratchet cross-feed that can hold one or two cutting bits; user can set up a template that guides the bits for compound beveling of pipe up to 24 in. diam with the need for adjustments.





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Braden adds to filter line

Braden Manufacturing LLC, Tulsa, Okla, announces the availability of high-performance static cartridge (SC) filters for gas turbines (visit www.bradenfilters.com). The dual-stage filter is a direct replacement for OEM filter cartridges on LM2500, LM5000, and LM6000 aeros, and large frame machines.

The new cartridges are characterized by an inner prefilter of nonwoven polyester and an outer primary element that is available in several media to suit environmental conditions. Braden says that performance is superior to competitive cartridge-type GT filters in several categories. ASHRAE 52.1 test results indicate reduced initial pressure drop, high average dust spot efficiency, and high dust-holding capacity.

Actuant buys D L Ricci

Actuant Corp, Milwaukee (www.actuant.com), completes the purchase of D L Ricci Corp. The global conglomerate has annual sales in excess of \$1 billion and consists of two groups of companies: tools and supplies, and engineered solutions.

D L Ricci will be managed as part of the Hydratight business, led by President Brian Kobylinski, in the parent's tools and supplies division. D L Ricci President Dino Ricci and his management team of Steve Earney, VP sales, and COO Bob Deter, will continue to manage the business in Red Wing, Minn; they report to Kobylinski.

Hydratight is well known in the power generation sector for its hydraulic torque and tension tools, Morgrip pipe connectors, asset management software, and in-situ bolting and machining services.

Sulzer Enpro continues to expand

Sulzer Enpro, a business unit of Sulzer Turbo Services, Zurich, buys Great Lakes Ignition & Supply Inc. The Michigan company is known for its reciprocating engine and ignition unit repair shops and inventory of critical spare parts. The strategic acquisition extends Sulzer Enpro's presence into the Upper Midwest and provides a base for its field-service activities in the region.



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