

Overcoming the Hurdle of Emissions Control, Creative Co-Generation Cuts Calif. Foundry's Costs

Techni-Cast Corp., a foundry and machined products firm in South Gate, California, shaved its energy bills by generating power on-site with a natural gas-fueled co-generation system that “recycles” waste heat and meets some of the toughest exhaust emissions limits in the U.S. Even with today’s high natural gas prices, the project saves the company about 33 percent on electricity, according to president Bryn Van Hiel.

A key challenge in the Techni-Cast co-generation project was meeting the strict emissions control requirements of the South Coast Air Quality Management District (SCAQMD), an area that includes Los Angeles. With the help of Oklahoma-based MIRATECH Corp. and its subsidiary, MIRATECH SCR Corp., Techni-Cast found innovative ways to meet and sometimes exceed these requirements without jeopardizing bottom-line co-generation savings, Van Hiel said.

Techni-Cast product lines are centrifugally cast in aluminum, copper, iron, nickel and cobalt base alloys and include both rough alloy castings and machined products such as cylinders, washers, bushings, bearings, seat rings, valve bodies, and solid bar stock. Customers are in the petrochemical, valves, pumps, food products, machinery, hydraulics, recreational vehicles, commercial aircraft and military industries.

Van Hiel, a mechanical engineer, developed the Techni-Cast co-generation system after the California energy crisis of 2000 – 2001, when “rolling blackouts” and utility rate hikes rocked Golden State industry. “During the three to four years after 9-11, business took a dive. If we hadn’t put in a generator, I don’t know if we’d be alive today,” Van Hiel said.

The Techni-Cast cogeneration system is driven by a GE/Jenbacher 320 engine, a V20 natural gas-fueled unit. Techni-Cast operates its



Techni-Cast Corp., a foundry based in South Gate, Calif., has met some of the nation’s toughest emissions requirements in a creative combined-heat-and-power project, with emissions solutions provided by MIRATECH.



Techni-Cast emissions solutions include both a MIRATECH Selective Catalytic Reduction (SCR) system for NOx compliance, and a Non-Selective Catalytic Reduction System, the MIRATECH Oxidation Catalyst, for CO, HC, VOCs and HAPs compliance.

Jenbacher six days a week, 24 hours a day, Van Hiel said. “We’re good Christian people so we give it a rest on Sundays.”

Lean-Burn Emissions Control

The Techni-Cast Jenbacher, like most current natural-gas engines used to drive generators, runs “lean,” partly to hold down fuel costs. This complicates emissions compliance, said MIRATECH Sales Manager Nick Deter.

SCAQMD emissions regulations require reduction of three air pollutants, Deter explained: oxides of nitrogen (NOx), carbon monoxide (CO), and hydrocarbons (HC). HC regulations include Volatile Organic Compounds (VOCs) and EPA-listed Hazardous Air Pollutants (HAPs), such as formaldehyde and acrolein.

With rich-burn engines, a “3-Way” Non-Selective Catalytic Reduction (NSCR) system can ensure compliance for all three classes of pollutant, added MIRATECH Engineering Manager John Sartain. But when an engine runs lean, excess air in the exhaust stream requires a Selective Catalytic Reduction (SCR) system to meet NOx requirements, Sartain said.

The emissions control solution MIRATECH installed at the Techni-Cast plant combines technology developed by MIRATECH’s Swiss-based partner, HUG Engineering, a leader in the field, and a MIRATECH NSCR Oxidation Catalyst system, said MIRATECH SCR Project Manager Mike Owings.

“As HUG Engineering’s sole North American

partner, MIRATECH can deliver the world’s most advanced SCR technology to customers, backed by full service and support based here in the U.S.,” Owings said. Van Hiel attests to the benefits: “We’ve had things come up from time to time and MIRATECH has always been very responsive, from the VP of operations down to their engineers.”

MIRATECH SCR: Reducing Hard NOx

The MIRATECH SCR system offers the option of using either ammonia or aqueous urea and a catalyst to break down NOx into harmless nitrogen, oxygen and water. Sartain noted that the MIRATECH SCR catalyst also significantly reduces formaldehyde. Techni-Cast chose to use urea in its SCR system, since urea is both less expensive and easier to store and handle than ammonia. Though ammonia is classified by the U.S. Occupational Safety & Health Administration as a flammable and hazardous material, it does not have the temperature and volume storage requirements of aqueous urea, Sartain pointed out.

Techni-Cast’s SCR system automatically monitors “tailpipe” exhaust NOx levels. This allows adjustment of reactant injection rates to ensure compliance and cost-effective reactant use, Deter said.

NSCR: CO, HC, VOCs & HAPS

To control CO and hydrocarbon emissions, Van Hiel chose the MIRATECH Oxidation Catalyst, housed in a MIRATECH catalyst-

silencer combo unit placed upstream of the Techni-Cast SCR system. A version of the MIRATECH QCC catalyst-silencer modified to allow catalyst element replacement, the unit reduces noise as well as air pollutants, Detor said. MIRATECH catalyst-silencers offer two grades of noise reduction: the QCC and RCS reduce sound by 25-30 decibels (dBA), while the QCH and RHS “hospital grade” units cut noise by an additional five dBA for total sound attenuation of 30 to 35 dBA.

The MIRATECH Oxidation Catalyst simultaneously reduces CO, HC, VOCs, HAPs and particulates, Sartain said. For Techni-Cast, the company developed a custom-version of its standard catalyst element design. The element is constructed of corrugated metal foil wash-coated with a slurry containing precious-metal-group catalysts such as platinum and rhodium. This wash-coated foil is tightly wound around a steel spool-post, forming a “honeycomb” pattern that maximizes catalyst contact with exhaust gasses while resisting shock and vibration as well as fouling and catalyst “poisoning” by materials such as lead in the exhaust stream. The patented MIRATECH banding and pinning process adds durability and strength.

Before the Oxidation Catalyst could be put to work, Techni-Cast needed to overcome yet another challenge: the Jenbacher’s 1,100° exhaust temperature. The catalyst is designed to withstand temperatures as high as 932° – ample for most applications, but not high enough for the Techni-Cast system, Owings said.

To solve the problem, Van Hiel and MIRATECH distributor Bill Rosentreter,



Techni-Cast’s combined-heat-and-power system uses waste-heat from electrical generation to pre-heat metal before melting, thus reducing the overall energy requirements of foundry operations.

president of Otto H. Rosentreter Co., developed a forced-air duct system to cool the exhaust to 880° before it enters the catalyst-silencer combo. The Techni-Cast engine, generator, ductwork, and emissions control system are housed in a 45’ x 8’ x 8’ structure. Van Hiel said it looks like a cargo container.

The company’s cogeneration emissions control system cuts NOx by more than 90 percent and reduces other regulated air pollutants to less than five parts per million, according to Detor. Since current regulations cap these emissions at 13 parts per million, Techni-Cast is prepared if regulations tighten – “and just about everybody I know expects the regs will tighten,” Detor added.

Energy “Recycling”

When treated exhaust exits the system, Techni-Cast pipes it into a preheating oven, which raises to 800° the temperature of metal to be melted down in foundry operations. This metal includes crushed and washed chips, scrap returns and ingots, all placed in the preheating oven in 55-gallon metal drums. Pre-heating saves Techni-Cast money with every degree: the hotter the metal gets, the less energy Techni-Cast has to buy or produce to melt it.

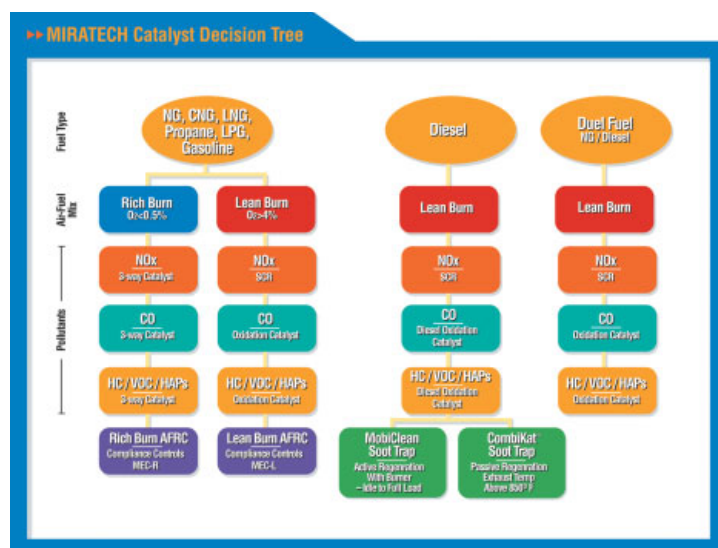
From the preheating oven, Techni-Cast’s cogen system exhaust flows through a “bag house” where a 1,500-filter dust collection system eliminates particulates it might have picked up in the preheating process. After the bag house, the exhaust goes through a HEPA filter, which Van Hiel said is 99.97 efficient. Then, the exhaust is dispersed into the California environment. “The air we’re releasing into the atmosphere is a lot cleaner than the air going into our engine,” Van Hiel surmised.

Techni-Cast’s creative use of its combined-heat-and-power system doesn’t stop there. Engine jacket water, used to cool the company’s generator, does double-duty in an absorption chiller system that provides heating, cooling and humidity control for Techni-Cast offices, metrology and chemical analytical labs, Van Hiel said.

Bottom-Line Benefits

Techni-Cast now produces about 82 percent of the electricity it uses, and has cut energy requirements both through its use of exhaust gas for metal preheating and generator jacket water for air conditioning. Plus, when commercial customers combine co-gen with “energy-recycling” measures, as Techni-Cast has done, the local utility, Southern California Edison (SoCal Edison), exempts them from certain fees for ten years. Techni-Cast is now in its fourth year of exemption.

“We started generating our own electricity after SoCal Edison more than doubled its rates. Back then, gas prices were around \$2.50/mmbtu. Now, we’re paying \$6.25 to \$6.50. Even with the high gas prices, we’re producing electricity for a little less than 10 cents per kilowatt-hour. If we were buying utility electricity, it would cost 16 to 17 cents per kilowatt-hour. So our net cost is still a third less than what we were paying before we made the



The “MIRATECH Catalyst Decision Tree” illustrates the different types of emission solution needed by stationary engines operating with different types of fuel and air-fuel mix.

change,” Van Hiel said.

Rosentreter, who has helped Van Hiel with Techni-Cast’s exhaust systems for more than 30 years, said the project fits the Techni-Cast mold: “Bryn Van Hiel is conscientious about the environment. He’s been innovative and aggressive in solving his energy problems in a way that’s friendly to the environment.”

Beyond the bankable benefits, Techni-Cast’s effective use of electricity has brought it national recognition. In 2002, Techni-Cast was awarded the National Electrical Contractors Association’s Electrical Excellence Award. With a little help from friends like Rosentreter and MIRATECH, the company has shown that creative cogen can meet emissions control requirements, benefit the environment and pay off in net cost-savings all at the same time.

According to Rosentreter, Techni-Cast is the only centrifugal foundry on the West Coast. Techni-Cast employs 100 people and has a long history in Southern California. Van Hiel’s father started the company in 1950 and it was re-named Techni-Cast in 1954. It has been in its present location in South Gate since 1972.

A privately held company, MIRATECH Corp. and its subsidiary MIRATECH SCR Corp. are leaders in the development and engineering of emission control and engine performance technology for industrial engines. Both companies are based in Tulsa, OK, with sales offices located across North America.

For more information about MIRATECH emissions solutions, call 1-800-640-3141, or visit www.MIRATECHcorp.com



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