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Power connection

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Enginator® Units Power Bangladesh Knitting Mill

Textile production is one of the fastest growth industries in Bangladesh. Arif Knitspin Mills, Ltd., which recently opened a large new facility located in the capital city of Dhaka, is a prime example.

Arif Knitspin, Ltd. receives raw cotton and then spins it into cotton thread. The cotton bales, although usually from Africa, may come from many nations. A labor- and energy-intensive process, once the mill's looms are running any unplanned stops can bring disastrous consequences. When production is halted, due to an energy shortage or other reason, the spindles have to be re-threaded which causes a flaw in the thread. While the plant only spins thread at the present time, future plans call for weaving and dying areas to be built on-site.

Dhaka is a city of nearly 4 million and the local power grid is not always reliable. Company officials knew that to produce a quality product the electric power available to the plant must be of equal quality and readily available at all times. The answer came in the form of four Waukesha Engine Enginator natural gas fueled engine/generator units purchased through Dana Engineers International, the local Waukesha Engine Distributor.

The mill uses a combination of VHP™ L5794GSI and L7044GSI Enginator® units to produce the nearly four megawatts of power it needs each day. The on-site power plant, or distributed generation system, allows Arif Knitspin to operate in "island" mode, completely independent of the local power grid.

The Enginator is a factory-packaged natural gas engine and generator unit that is widely used to provide reliable electrical power for industrial and commercial applications. Dana Engineers International, which has its main office in Dhaka, has achieved great success in placing these units in area industrial and textile plants where they are often used to supply the electrical needs of an entire facility.

The Enginators came on-line in May of 2002 and two more are on order for expected plant expansion. This is the mill's first experience with Waukesha products and company officials are very happy with their performance. ■

What's Inside

Below: Spinning equipment at Arif Knitspin Mills is kept up and running by four Waukesha Engine Enginators (inset).

We've Met Many Challenges, But They Will Continue

The year 2002 is coming to a close and as we look back we see both success and failure. When I start analyzing these thoughts, I quickly come to the conclusion that success came through the efforts of all departments by producing effectively in a poor economical environment, and keeping to their revised budgets and goals. Our success was that we made ourselves cost effective in 2002, yet still got the job done. For that I thank you.

Failures were mostly related to results that were the outcome of a poor economy, not poor performance. Waukesha people did an excellent job of managing during the poor economy by maximizing our Earnings Before Interest, Tax, Depreciation and Amortization (EBITDA) and reducing our working capital (receivables, inventory and payables) – two important measurements in running a company.

"Waukesha people did an excellent job of managing during the poor economy."

Looking at the skills in running our business in 2002 compared to 2001 (our best year on record), they are different, yet the same. We needed communication to understand the different problems in 2001 versus 2002. We needed to work together to readjust the workload from a high backlog in 2001 to a low backlog in 2002. We needed to serve our customers, even though we were not getting new orders. In summary, it seems we had to work just as hard or maybe harder in 2002 than we did in 2001.

Looking forward to 2003, the current compression market condition will continue; therefore it could be another challenging year for the Waukesha team. There is one outstanding issue next year that I am looking forward to and that is the High Performance Work Organization (HPWO). The HPWO effort will change our culture, thinking and process of doing business. HPWO will make us a better company. It won't come quickly, simply because of the change in culture that all of us must go through. But as we know: good things never come easy.

I would like to thank our Distributors, Power Partners (gas compression) and Power Energy Partners (power generation) for working with us through a tough year. We do appreciate our relationship with you and will continually work to make it better.

It's now coming to that time of year when we think back on all our blessings no matter how big or how small. It's that time of year when I must thank you for a job well done. But most importantly, it's that time of year when we put work aside and spend time with our families and loved ones.

May our blessings continue and the new year bring hope and happiness to all. ■

Bill O'Connor, President

Sao Paulo Hotel Saves with Waukesha

With 16 million people and counting, Sao Paulo is easily the largest city in South America. The luxurious Renaissance Hotel fronts Avenue Paulista, often referred to as the "Wall Street" of Brazil, which runs through the heart of this vibrant metropolis. One of the newest hotels in the city and among the finest in all of South America, the 452 room Renaissance includes 57 suites; two restaurants; lobby, cigar and snack bars; swimming pool, sauna, massage salon, squash courts and more. It also has banquet halls and meeting rooms complete with A/V facilities. The five-year-old hotel is owned by a Brazilian pension fund and operated as a Marriott.

The Renaissance Hotel also has one other feature installed shortly after it was built five years ago — a distributed generation power plant that uses two natural gas fueled engines manufactured by Waukesha Engine. The system was designed, installed and is operated by Newmar Energia, a Distributed Energy Service Company, headquartered in a nearby building.

Newmar Energia has 30 people on staff, mostly engineers and operators, and can handle design, build and maintenance. A total energy service provider based on distributed generation technologies, systems and services, Newmar Energia offers complete packaged energy solutions geared to the customer's needs, according to Newton do Amaral Fiqueiredo, president.

"The packaged solution concept is important to our customers," Amaral Fiqueiredo says. "We are full-time involved with our customers to find the best energy options for them. We can handle all facets from energy diagnosis up to plant operation and maintenance, as well as surplus power trading. Our strategic partners are foreign and Brazilian companies, including Waukesha Engine and its local distributor Stemac, all leaders in their markets offering advanced technology products and services."

The hotel's engine/generator sets were packaged by Stemac, the Waukesha Engine Distributor in Brazil. The distributed generation system uses WAG Generators driven by Waukesha VGF™ P48GLD engines. The project was Newmar Energia's first experience with Waukesha Engine and Stemac, and has led to a good working relationship with all parties.

Because the power plant is located deep within the lower level of the hotel, some engineering problems had to be carefully thought out and executed. For example, the outside exhaust louvers are 70 meters from the engines, while roof-mounted heat exchangers are cooling is 125 meters from the engine room. Another problem was the hotel was already in operation when it was decided to install the engine.

"This was a very complex project, one that was a special challenge," Amaral Fiqueiredo says. "During the installation phase both British Prime Minister Tony Blair and US President Bill Clinton were guests at the hotel, because the Renaissance is the most important hotel in all of San Paulo. And, this was our first experience with Waukesha engines; everything went well. The engines have already accumulated over a thousand hours of operation (running during daily peak periods when electricity charges can be as much as eight times the normal rate) since they were installed a year ago. This is a very complex system, and the engines have handled it well. Exhaust catalysts are not required because natural gas is very clean burning, so the fact that the engines are providing power is undetectable from inside the hotel or even near the street-level exhaust area."

Newton do Amaral Fiqueiredo notes that the hotel owner is very happy with the power plant's return of investment and recoups about 25 percent of investment each year, for a four-year payback period. The owner of the hotel bought a package that includes operation and maintenance. He notes that the hotel was in full operation during the famous energy blackout of January 2001. ■

Above: One of three Enginator® power generators in operation at the Rosedale plant. Together, all three Enginator units provide 2.7 MW of power.

"This is a very complex system, and the engines have handled it well."

– Newton do Amaral Fiqueiredo, President, Newmar Energia

Poland Grows Natural Gas Network Powered by Waukesha Engines

Above: Natural gas pipelines from North Sea fields, Siberia, and the Netherlands intersect in Poland for re-distribution throughout Europe.

"…Waukesha has done modifications and upgrades at no charge and stand behind the claims they make for their engines."

– Andrzej Pajor, Engineer and Technical Advisor, Poznan Facility

Because of its central location between the European Union nations to the west and the old Soviet bloc to the east, Poland is well on its way to becoming the "crossroads of Europe."

Over the past dozen years, the nation's highways have been upgraded along with telecommunications lines. Poland's electrical power system, the largest in Central Europe, and limited natural gas delivery network are the latest areas to be brought up to western European standards. These basic infrastructure concerns are extremely important for the nation, with its rich and proud history, seeking acceptance into the European Union in 2004.

Today most of the power generation in Poland is based on coal (about 94%), about 3 percent hydro-electric, and around one-half percent from gas-fired generating plants. But by the end of this decade, it's estimated that natural gas will play a far bigger role, and will provide about 15 percent of electricity from both peaking and co-generation plants.

Shifting to more dependence on natural gas will have a significant beneficial effect on the environment, which is important because as a future member of the EU, Poland is expected to meet strict environmental standards.

In the area of natural gas pipelines, Poland is already well on the way to becoming a crossroads nation. The country receives gas from Siberian fields in Russia, Dutch fields, and from North Sea platforms via Belgium, Holland and Germany. Poland also has some natural gas reserves of its own along its western border.

A number of important compression stations were recently commissioned in western Poland to handle the large amounts of natural gas coming into the country. One is near Wroclaw, a city in western Poland that's the headquarters for PGNiG S.A., the regional energy authority. Another is near Poznan, about 125 kilometers directly north, which is under the direction of Warsaw-based, government-owned Polish Oil and Gas Company, POGC. Both sites depend on natural gas fueled engines manufactured by Waukesha Engine, Waukesha, Wisconsin, USA.

The Zuchlow site, near Poznan, is a processing plant for eight smaller sites that gather gas from 50 wells in a two kilometer area. There are 20 engines in use altogether and the area has been a steady supplier of high quality, high methane sweet gas for more than two decades. The gas produced cannot be exported and must be consumed in Poland. Some 80,000 cubic meters per hour is produced here and is moved into and out of underground storage areas.

Prior to 1994, the processing station relied on natural pressure from the wells to bring the gas. In that year the first Waukesha VHPs – four L5790GLs and three L5108GLs were commissioned to boost the natural gas flow pressure. The newest engines on site are VHP™ L7042GLs packaged with Ariel JGD/2 compressors that were part of a plant expansion completed in 2001 as a turnkey project by Alstom, who maintains a Polish design office and production facility in Elblag, near Gdansk.

Most of the Waukesha VHP engines in Poland were supplied by Landre Ruhaak. The Distributor maintains service and parts departments in Holland and Germany that serve the Polish sites. Enerflex of Calgary, Canada recently acquired the Landre Ruhaak company, based in the Netherlands.

The Poznan site's ATGL engine/compressor units were packaged by Enerflex and then flown from Canada to Poland on special Antonov cargo aircraft (see photo at right).

Landre Ruhaak was the first European distributor of Waukesha Engine in 1963. The company has been doing business in Poland for several years and was instrumental in helping get the compression sites on-line, each of which were several million dollar (US$) projects.

Andrzej Pajor, an engineer and the technical adviser at the Poznan facility, has had 12 years of experience with Waukesha engines as well as with engines from other manufacturers. He prefers his Waukesha units "because of the good product support, which is important to a country like Poland which is building a natural gas delivery infrastructure."

"Some manufacturers did only minimum service after the sale, while others left the country a year after making a sale," he says. "But Waukesha has done modifications and upgrades at no charge and stand behind the claims they make for their engines. The engines are made with quality parts. If the company states a component will reach 20,000 hours of service life, it will last at least that long and even longer."

At a Polish Oil and Gas Company facility near Kryzywa, gas is received from four major pipelines and re-distributed. This site employs the first Supervisory Control And Data Acquisition (SCADA) system in Poland. It is manned 8 hours each day and remotely controlled from POGC headquarters in Wroclaw, about 40 kilometers away.

The plant handled 500 million cubic meters of gas last year, about 10 percent more than the previous year. Local consumption is also rising to meet the needs of new industrial development. The site receives and distributes natural gas from Germany, Norway and Russia.

The compressors were packaged in Tulsa, Oklahoma, by Hanover and then brought by ship. ABB Gazpetro was the contractor for the site and provided a two-year maintenance warranty. A similar plant in Germany cost more than twice the final cost for this facility, one official noted.

The Krzywa transmission site has three Waukesha Engine VHP P9390GSIs running at 1200 rpm which handle between 80 – 120 million cubic meters per hour. Another nearby site at Jeleniow, about 80 kilometers from Wroclaw, has two VHP P9390GSIs. Altogether there are about 30 Waukesha engines in Poland mostly handling gas compression duties and two more are on the way.

According to Krzytof Hnatio, Director, Polish Oil and Gas Company Regional Transmission Division in Wroclaw, "Large, modern western-style gas compression facilities are a new experience for us, but they are very important to our nation.

"These plants were constructed quickly to meet immediate needs and helping to position Poland as a vital component in Europe's growing natural gas pipeline infrastructure. We hope to build more, but this depends on the government and economy in our region. We are satisfied with our engines and feel they are a good choice for our application." ■

"We are satisfied with our engines and feel they are a good choice for our application."

– Krzytof Hnatio, Director, Polish Oil and Gas Company Regional Transmission Division

ESM™ Slated to Become Standard Controller On VHP™ Series Four® Engines by 2004

During 2002, Waukesha Engine made several advancements in its engine line-up and controls. These products, detailed below, will be introduced in early 2003. At the same time, two products introduced in 2001 – the VHP Series Four L5774LT and the ESM™, an engine system manager – have been given wide acceptance in the gas engine marketplace.

In 2002, Waukesha announced that the ESM option is now available on two more models of its most popular engine line, the VHP™. It can be ordered on the Series Four L7044GSI and 5794GSI.

In addition, the ESM will be released on the L5794LT, L5774LT and the F3524GSI throughout 2003, with the expectation that the engine system manager will be the standard controller on all Series Four products by January 1, 2004.

The ESM is a total engine management system that's directed by the natural gas-fueled engine's Engine Control Unit (ECU) to optimize engine performance around the clock. The system monitors speed, pressure, temperatures and other engine conditions. As an integrated system, it controls and optimizes ignition timing, speed governing and handles stop-start functions plus can provide diagnostic help and fault logging, when needed. The ESM is a solid-state, engine-mounted "technician" that can instantly communicate engine conditions via satellite, cellular connection, radio frequency or land phone lines and relay the current engine status to an internet server, computer or pager.

The "power behind performance," the ESM provides continuous diagnostic monitoring and can continue to operate through most sensor failures, alerting the operator of any problems. Through Waukesha's Electronic Service Program (ESP), the operator can have full access to all ESM information and links to E-help, which provides step-by-step troubleshooting for any alarm or shutdown code.

The ESM can help lower the cost of running an engine by optimizing engine timing for every speed and load to reduce fuel consumption — often the largest operating cost. An Ignition Power Module - Diagnostic (IPM-D) provides automatically controlled dual voltage levels to maximize spark plug life. The ESM features automatic calibration for detonation protection and throttle operation, requiring no operator intervention, while its speed governing system design reduces throttle linkage and throttle actuator maintenance.

The ESM's electric throttle actuator provides optimal load step performance. It can take even large load steps through a "load coming" feature — a signal that allows the engine to anticipate the load step, maximizing the engine's capability. ■

Below: The ESM engine system manager option is now available on two more VHP engine models. It can be ordered on the Series Four L7044GSI and the 5794GSI. In addition, the ESM will be released on the L5794LT, the L5774LT and the F3524GSI throughout 2003, with the expectation that the engine system manager will be the standard controller on all Series Four products by January 1, 2004.

On-Site CHP Systems Generating Big Savings

When two or more elements interact together to provide an end result that is greater than the sum of the individual parts, synergy has occured. Waukesha Engine and its newest DOEM (Distributor Original Equipment Manufacturer), CRM Energy Technologies along with distributor Kraft Power are combining many elements in a synergistic way to bring economical power to East Coast energy users.

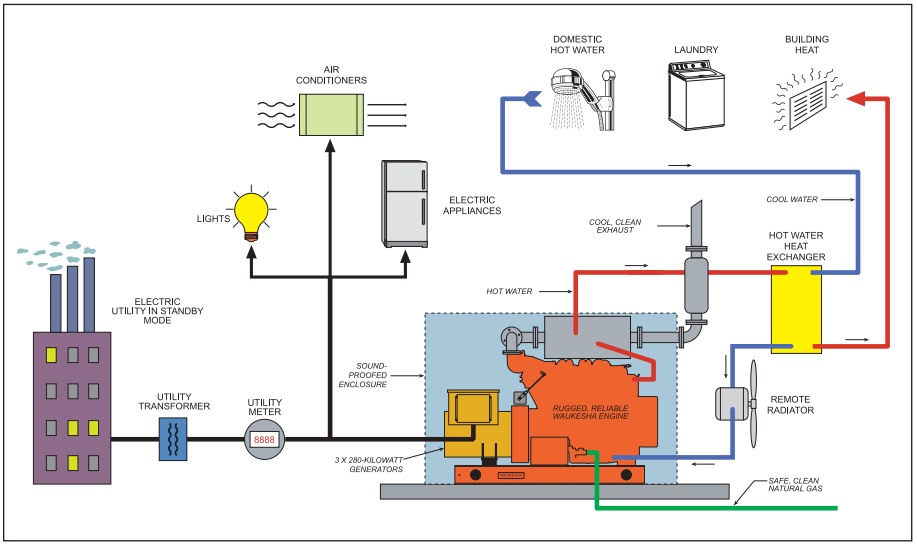
CRM, started in 1996 and based near New York City, has developed a combined heat and power energy solution designed to fill the needs of users who have the right energy profile. Typically, these potential customers use energy around the clock or require copious amounts of low-pressure steam or hot water. Prime examples would include apartments, condominiums, hotels and motels, hospitals, nursing homes, bakeries, dairies, and some industrial processing plants. Buildings occupied or enterprises operated only part of the day would not be good candidates for a CRM on-site energy system.

The company's On-site™ Combined Heat and Power (CHP) System uses proven technology and can be extremely cost-effective, according to Kurt M. Tella, CRM chairman and CEO of the ten-person firm. "If a building or business has high thermal requirements in addition to needing reliable electricity, then they are a perfect match us," he says. "We can offer payback in three years or less by producing electricity for less and capturing at least half of the 'waste' heat produced by the engine and turn it into usable commodity, like hot water."

As a DOEM, CRM Energy Technologies works with the local distributor, Kraft Power, to increase the market position, financial strength and presence of each other. The program is designed to pass products through Waukesha Engine Distributors to a qualified DOEM at the lowest possible cost, while securing the cooperation and support of the entire worldwide distributor network.

The on-site CHP system marketed by CRM is unique in a number of ways. For one, CRM provides a "turnkey" package including design and construction, and then relies on Kraft Power to handle scheduled maintenance. The company does around 25 installations a year. Another is that a CRM system is designed to supplement local grid power rather than replace it.

"We use several proprietary technologies and innovations including software that we've developed over the years. Our 'Energy on Demand' feature is our 'trade secret' and involves the use of inductive generators to follow a building's energy load in a unique way that also allow us a parallel utility interconnect. This way, all the customer's existing equipment and systems stay in place and we provide all of the base load and can supplement with grid power for peak periods or when rates are low."



Above: A Waukesha Engine is an integral component of a typical CRM On-Site™ CHP system as shown in this schematic used in the company's advertising.

Another interesting factor is a sister company, Brooklyn-based Great Eastern Energy, provides the natural gas to CRM clients. Headed by President and CFO Allen Brenner, Great Eastern buys gas wholesale at the source and passes savings along to customers.

Because of sound and size requirements in many buildings, CRM relies on Waukesha Engine VSG™ and VGF™ engines.

"We decided to use Waukesha engines rather than convert diesel engines to run on clean-burning natural gas, or use another company's products, because we consider them to be most robust, rugged and reliable engines available in the world," Tella says. "They are a high-quality component of our system and complement the entire package. They feature high availability and long run times, which help our customers reach the payback period on time." ■

The CRM systems uses dependable Waukesha VSG and VGF GSID engines.

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Power Generation Takes On New Sizes

When evaluating a new engine installation for an industrial or commercial facility many basic, but vital, parameters will help lead the consulting engineer to choose the appropriate technology that will be the best overall "fit".

One basic requirement to be considered is an understanding of the engine's floor-area "footprint" along with its height restrictions. If these are not carefully considered, the result usually is an installation where the engineer's layout may have looked good on paper, but failed miserably in reality. As an example, a Distributor or Power Partner serviceman is called to the site where he needs to torque an engine's head studs, but finds he can't because his six-foot long torque wrench is hitting the adjacent wall.

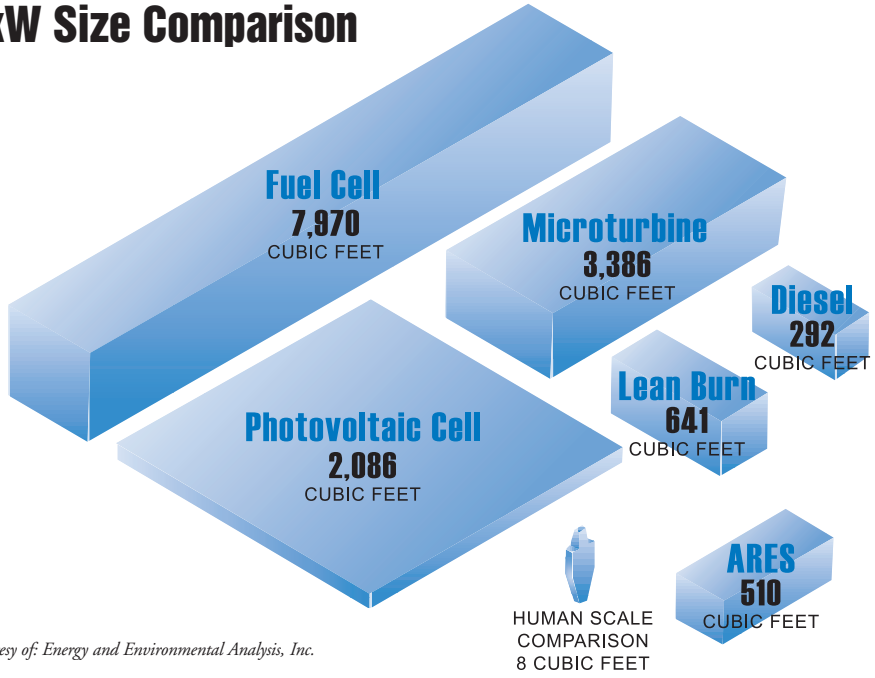
Let's examine the physical size differences of competing 500 kW technologies so we can be more aware of the footprint requirements of each. Our comparison will evaluate diesel engines, gaseous lean burn engines, and gaseous ARES (Advance Reciprocating Engine System) engines, microturbines, fuel cells, and photovoltaic cells. As a reference point, we'll use a typical six-foot male who requires an area of about 0.8 cubic feet.

The typical diesel engine product has the smallest footprint, which allows for high power density at a low cost — but produces high emissions. The diesel 500 kW product is about half the size of a comparable gaseous lean burn engine, which would be our VGF L36GL-size product.

The ARES unit, which will be a high efficiency, low emission product offering, will utilize the VGF H24GL frame and should be available around 2005. All of these comparable technologies offer reasonable footprints for the industrial or commercial customer.

Current technology photovoltaic cells are relatively flat but a 500 kW power load would require an area of about 50 feet by 50 feet. Typically this kind of space is only found on a building's rooftop.

500 kW Size Comparison



Graphics courtesy of: Energy and Environmental Analysis, Inc.

As for microturbines, although not commercially available over 250 kW, two units could be paralleled together but they would need an area of 23 feet by 23 feet.

Finally, fuel cell blocks paralleled together to produce 500 kW would need the most space. While technology improvements are decreasing the size and cost of the fuel cell, the market is still looking at a substantial area of 12 feet by 70 feet.

As you can see, future technologies will bring benefits and advantages. However, when evaluating the near-term project and assisting the customer and defining the installation parameters, be aware of the advantages of a lean burn engine system and upcoming ARES technologies. ■

John Hoeft
Director – Marketing

Taking the Show on the Road

Waukesha will be well represented worldwide over the next several months. Here is where we'll be:

December 10
Power-Gen International
Orlando, FL

January 6
6th Annual Landfill Methane Outreach Program
Washington, DC

February 17
Gas Compression Association
Galveston, TX

Waukesha Power Connection

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