



■ Packages fabricated by NGC provide plenty of walk-around room, which also allows for the installation of customer-specified equipment and indoor storage of operating materials.

NEW AND RENEWED WITH DISCIPLINE

NGC Process Systems Restages, Recylinders, Refurbishes and Repackages Existing Compressor Equipment to Optimize its Lifespan and Performance

By Neil Purslow

NGC Process Systems (NGC) is a Calgary, Alberta, Canada-based company that specializes in the evaluation, reconfiguration and redeployment of existing reciprocating compression assets. It also fabricates compressor packages ranging from 50 to 600 hp (37 to 447 kW). “When I started the company in 2003, I met with a number of industry consultants and natural gas producers to gain a thorough understanding of the compression needs of the industry,” said Shane Guiltner, president of NGC. “From those meetings, I realized there were a large number of compressor packages in operation that didn’t match the conditions of the reservoir. I also learned that many producers choose to buy additional compression, rather than retrofit existing units to match the new reservoir conditions.”

As NGC analyzed the issue further, it found that many producers opted to buy new compression assets because of previous difficulties experienced with retrofit projects. Some of those difficulties involved scheduling (compressors were out of service much

longer than originally predicted) and estimating the cost of the work (significant cost over-runs were commonplace). As a result of these uncertainties, many producers viewed retrofit projects as too risky. “It wasn’t a very good situation,” continued Guiltner. “In many instances, producers were adding horsepower to fleets where excess horsepower already existed. Customers were also incurring additional installation costs, which in Canada can be as high as the cost of the package.”

■ NGC provides insulated buildings with pre-painted exteriors and white liner interiors. Galvanized steel for the exterior is also available. The company also provides catalytic heaters with a 12 Vdc starting coil to assist in cold weather operation.



After a thorough analysis of the issues that affect the success of a retrofit project, NGC developed a business model that would address the optimization of existing reciprocating compression assets. This model was designed to provide certainty around delivery and cost, along with quality service at a competitive price. NGC works on all makes, models and sizes of reciprocating compressors and engines.

The retrofit process begins when NGC meets with customers to understand their current issues. Along with learning why the compressors are not utilized or optimized properly, NGC evaluates the future plans for the equipment, such as the introduction of additional wells or tying-in other facilities. All factors are then used to determine the future operating conditions for the compression equipment under review.

NGC then travels to the equipment site to perform a field audit. The field audit captures all critical data required to determine what needs to be completed to optimize the package. Standard data capture sheets developed by the company ensure that all required data are collected. Everything on the package is evaluated — from compressors, engines and coolers to control valves, process systems, piping, scrubbers and relief valves. NGC said that completing this upfront analysis significantly increases its ability to execute the project successfully.

All captured data are then analyzed to create the scope of work required for the project. Recommendations for optimization may include compressor restaging or recylindering, package modularization or refurbishment, engine and/or compressor overhauls, cooler section replacement, manufacture and installation of new scrubbers and pulsation bottles, piping and structural changes to the package or upgrading the control system. In some instances, field construction may also be recommended, such as replacing yard piping or modifying



■ (Left) NGC uses its field trailers on-site for service or retrofit projects. When a project begins, a field trailer, flatbed trailer containing all the fabricated components and a work crew of up to eight to 10 tradesmen arrive to complete the work. (Right) Field trailers are partitioned so that all of the hot and noisy equipment is located away from the shop area. Each trailer contains all of the equipment needed to complete a retrofit project.

production headers to match the package's increase in pipe size. In summary, the entire package and its surrounding processes are reviewed to determine the best approach to optimizing the package.

Once the replacement and upgrading recommendations have been determined, the project's scope of work is finalized. NGC then creates a detailed schedule outlining the activities that will be completed each day. This determines exactly how long the package will be out of service. NGS determines a fixed price for the project, a price that will not change unless the scope of the project is altered. Before the project is undertaken, the customer knows exactly how long it will take and how much it will cost.

NGC then reviews the project's work scope with the customer and, once accepted, the detailed design phase commences. In this phase, project designers review the equipment and processes in which it is involved

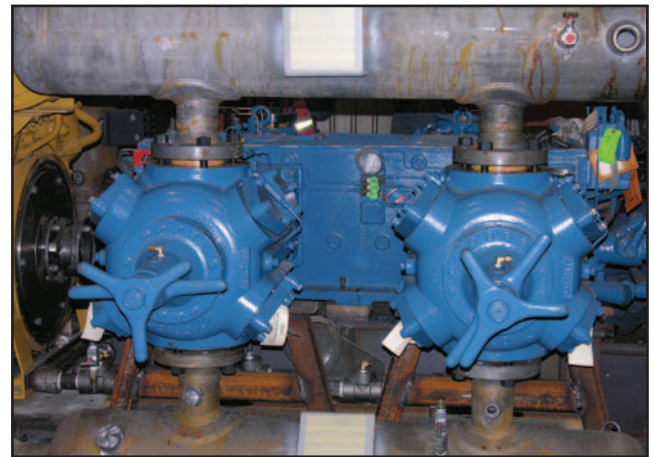
in detail. They travel back to the field to validate dimensions and to verify equipment and process characteristics. This step is necessary to ensure accuracy, since the majority of the new components are pre-built at NGC's fabrication facility prior to the start of the project. This process helps minimize field welds and shortens the downtime experienced by the customer.

NGC completes the majority of retrofit projects in the field. The company has two qualified field crews comprising tradesmen who possess the skills and experience to complete each project. Accompanying the crews and fabricated components are two fully equipped field trailers, which serve as "fabrication shops on wheels." These trailers contain welders, air compressor, threaders, cutters and all the tools required to complete the job, as well as a separate workshop area. Once on-site, the equipment that is to be replaced is dismantled and removed and new

components installed. Jobs typically take between three and 10 days to complete, depending upon the amount of work to be done.

The company has completed a range of retrofit projects. NGC has replaced a number of 800 to 1000 hp (597 to 746 kW) two-throw reciprocating compressors with four-throw units to handle suction pressures below 60 psi (4 bar). Other projects include upgrading or replacing compressors that are experiencing reliability issues with newer and more efficient models. The company has also undertaken many smaller projects, such as replacing cylinders and balancing compressors.

The primary focus of a retrofit project is to optimize the package, thereby matching it to the conditions of the reservoir. "If you can recylinder a machine to gain an additional million a day of gas," stated Guiltner, "you get a good trade-off with favorable economics. We're continuing to adjust our business model and feel good



■ (Left) NGC operates a fleet of fully equipped service trucks that provides maintenance and breakdown assistance to customers throughout western Canada. (Right) The standard 99 and 188 hp (74 and 140 kW) compressor packages use Ariel JGA/2 reciprocating compressors, which were selected because of their high total rod load capabilities and the flexibility to being able to handle larger cylinders, which reduces the need for recylindering.



■ **NGC manufactures and tests each pressure vessel in its 10,000 sq.ft. (929 m²) ASME-certified “U” stamp vessel fabrication facility.**

about the results because to date we have never exceeded our scheduled downtimes for a project.”

NGC also fabricates reciprocating compressor packages. The standard product line includes 99 and 188 hp (74 and 140 kW) packages that are built for 2% sour service. The company’s research showed that packages built for the lower horsepower ranges are moved extensively between sites, with the average length of time being six to eight months on a lease. In addition, many of the new, deeper pools brought on-stream in western Canada have a 1 to 2% concentration of H₂S. By using sour service as the standard on these packages, these units can be deployed in a greater number of applications. The sour service rating for a package can be increased without having to redesign the entire unit.

NGC decided that a heavier rod load compressor frame should be used to assist in the packages’ deployment in these applications. An Ariel JGA/2 was selected because its rod load totaled 20,000 lb. (88,964 N), which allows it to handle a greater range of conditions. A heavier rod load frame provides additional flexibility because the frame has the ability to run larger cylinders, which reduces the need for recylindering when the packages are moved. Future retrofits may also be cheaper because only the cylinders need to be changed.

Compressors on the 99 hp (74 kW) packages are driven by Cummins G8.3 engines, while 188 hp (140 kW) packages use the Cummins G855. All engines are six cylinder and naturally aspirated. Caterpillar engines and electric motors can be installed if a customer prefers. Control systems typically use Murphy panels provided by Spartan Controls, with pneumatic controls for suction pressure, recycle and

temperature. The company stated that customers prefer this type of control system because of its functionality and cost-effectiveness. PLC systems are optional.

All NGC packages use high-grade equipment — including mufflers and coolers — which allow the packages to run quietly. If a critical situation arises, NGC will work with an outside noise consultant to develop a solution for that location. Coolers from Air X-changers are used on all standard packages, as well as on most retrofit projects. All packages are self-contained and come with buildings designed for the Canadian climate. A list of standard options is available to customers, including such items as blow cases, meter runs, fuel gas filter separators, and generator and battery systems.

Packages can be used in low-, medium- and high-pressure applications. The process components are available in either 300, 600 or 900 ANSI design, depending upon the customer’s requirements. Packages can be used to deliver gas to sales de-

livery systems, but the majority of packages sold to date have been deployed in medium-pressure applications using both skid-mounted and trailer-mounted configurations. NGC will sell, lease or rent packages, and offers a lease-to-purchase option.

The company also custom fabricates reciprocating compressor packages up to 600 hp (447 kW). NGC designs each package for a specific location. It uses the same exacting fabrication processes used to create the standard packages. In addition, the company is the exclusive fabricator for Concept Compression’s screw compressor line. For Concept Compression, NGC fabricates 60, 90, 135, 200 and 280 hp (45, 67, 101 149, and 209 kW) packages using Sullair screw compressors and Arrow, Caterpillar and Cummins engines. Concept compression handles the installation and service of the units. This partnership allows Concept Compression to focus on applications better suited for screw compressor packages and NGC to manage those better suited to reciprocating designs.

NGC’s engineering group comprises experienced personnel that design and handle the entire range of projects it undertakes. The company uses Pro/Engineer a 3-D solid modeling design software for all projects.

Adjacent to the 9000 sq.ft. (836 m²) head office is a 12,000 sq.ft. (1115 m²) assembly plant in which packages are manufactured from early skid stages through to complete and tested units ready for shipment. The company utilized “value-added production concepts” to design a seven-stage assembly line with sub-assembly stations supporting the main line. The facility contains the necessary overhead lifting capacity and access doors for fabricating the various products. Guiltner stated that in 2006, NGC completed an average of five to six packages each week.

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One block away is the 10,000 sq.ft. (929 m²) ASME-certified "U" stamp vessel fabrication facility. In this building, all of the company's pressure vessels are manufactured. NGC tests, certifies and only then ships each unit to the assembly plant or field location for installation.

NGC is currently expanding its service network in western Canada. The company currently has two fully equipped service centers — one 5500 sq.ft. (511 m²) facility in Medicine Hat, Alberta, and another 3500 sq.ft. (325 m²) facility in Drumheller, Alberta. A third center is scheduled to open in 2007 in Fort St. John, British Columbia. NGC uses these facilities for recylindering, restaging and remodeling projects. A fleet of fully equipped service trucks complement the service centers by performing service and maintenance

activities on-site. Service options range from preventive maintenance to emergency breakdown repairs on all makes and models of reciprocating compressors and engines.

The company also provides an extensive line of spare parts, which are available for maintenance activities and minimizing equipment downtime. The company has developed an extensive network of suppliers throughout the industry, which is critical when trying to locate hard-to-find parts, such as cylinders for older compressors. NGC or the supplier refurbishes all used cylinders before being used on a retrofit project.

NGC has grown to a staff of 80 people. This includes office, engineers and sales personnel, as well as the various tradesmen and apprentices that comprise the field and fab-

rication crews. All retrofit project activities are completed in-house so that NGC controls all aspects of the project, which is important, since NGC is making firm commitments on price and schedule.

"We often think of the company as a three-legged stool," said Guiltner. "The legs represent our dedication to retrofitting, fabrication and service. Our plans are to make NGC stronger by strengthening the legs. To reach that goal, we intend to employ a third field crew to perform additional retrofit projects, add a third standard reciprocating package [400 hp (298 kW)] to the existing product offering, and open a third service center. We hope to eventually enter the international market, but not before our business model is well tested." ■