CURTISS-WRIGHT

EST Group

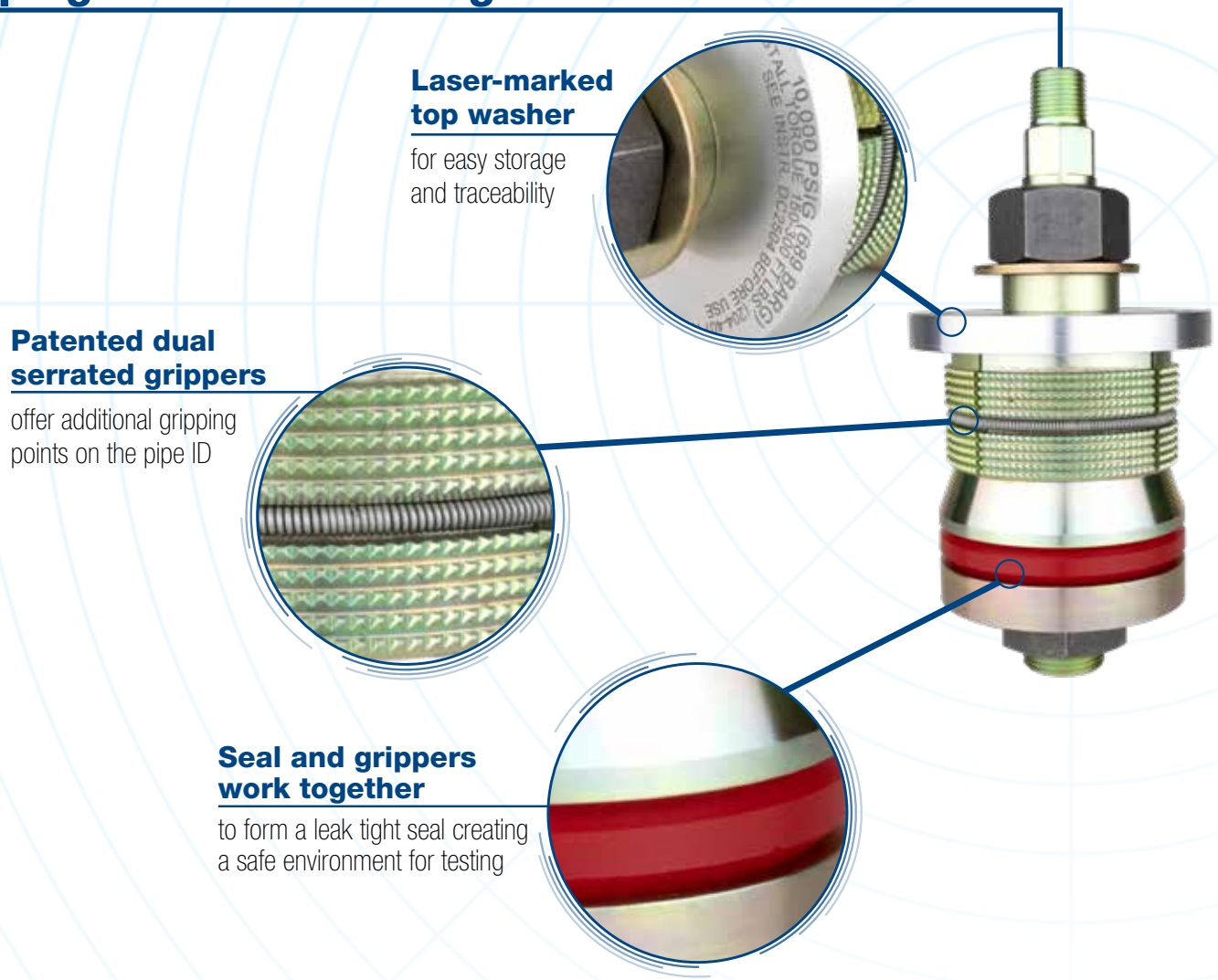
GripTight MAX® Test Plug

Putting New Build Pressure Tests on the Fast Track

SPECIAL EDITION

In the fast-paced realm of large-scale industrial construction projects, Engineering, Procurement, and Construction companies (EPCs) continually face demands to improve the efficiency of their processes and tighten up their project schedules. Their clients require that these projects be delivered on budget and on time, thus aligning with a go-to-market strategy that optimizes returns for their stakeholders.

GripTight MAX® Test Plug



Delivering on these expectations compels EPC firms to properly allocate all materials and trade personnel in order to avoid potential delays, minimize costs, and eliminate waste or liquidated damages. One way contractors achieve this is through modular fabrication, in which they build components off-site in a dedicated fabrication facility or module yard. The components are then shipped to the worksite for fast installation and easier integration into field operations.

Modular fabrication offers several benefits over on-site construction of components in the field, including improved efficiency, greater safety, quicker fabrication and assembly, and lower costs. A modular assembly process builds each component in a safe, environmentally controlled setting on a 24-hours-a-day, 7-days-a-week schedule, ensuring consistency of product and significant time savings compared to on-site construction.

However, further cost- and time-saving strategies are required to significantly speed up some construction and quality control processes, such as the pressure testing of newly built modular pipe spools. Curtiss-Wright EST Group recently introduced an initiative to apply its proven portfolio of pressure test and isolation plugs to new build projects. Specifically, these plugs will be used for high-pressure hydrostatic testing of piping systems that will be installed as part of plant upgrades and in new refineries; chemical plants; power plants; LNG facilities; and vessels including FPSOs, FLNGs, bulk liquid carriers, navy ships, and submarines.

A Secure Testing Solution

For more than 50 years, Curtiss-Wright EST Group has developed, manufactured, and delivered an array of test and isolation plugs to simplify maintenance schedules and streamline turnaround times for operation-critical piping in a range of process-intensive industries. These tools have saved users millions of dollars in equipment maintenance and downtime for existing facility turnarounds. Now, the plugs promise the same time- and cost-savings potential for testing new build pipe.

GripTight MAX® High Pressure Test Plugs provide a highly reliable, secure, and temporary pipe end closure that simplifies pressure testing of piping systems, pipe spools and racks, and pressure vessels. With an upper level test pressure rating of 15,000 PsiG (1,034 BarG), the plugs are a proven alternative to the conventional and time-consuming pressure testing process that calls for welding on end caps, conducting the pressure test, cutting off the end cap, and finally, re-beveling the pipe. In addition, EST Group's GripTight® Elbow plug provides a safe and effective solution for pipe spools and piping systems terminating in long-radius elbows at pressures up to 3,350 PsiG (231 BarG).

Employing test plugs for new builds eliminates the need for welded end caps, **saving up to 90% of the time** typically spent pressure testing pipe spools in modular builds using conventional techniques. That time savings manifests itself in a significant increase in the completion of test packages: EPCs using GripTight Test Plugs have observed up to a **500% increase in the number of test packs completed**. GripTight plugs avoid the need for welding equipment and free up welders to work on more critical parts of the module in support of meeting the project delivery schedule. The plugs also eliminate pre-heating, post-weld heat treatment, and the heat-affected zone at the pipe's end.

As its name implies, GripTight MAX is a gripping style plug. Unlike other pipe testing plugs that can loosen and eject under high pressure, the GripTight MAX uses the system's own test pressure to increase the seal and to grip the pipe more securely. The plug's patented, dual-serrated gripper design provides up to 1,000 gripping contact points on the inside pipe surface. As the pressure in the pipe increases, so does the gripping force against the wall. And because this gripping force is distributed over so many individual contact points, the risk of creating deep marks in the pipe wall is minimized. These features result in more reliable installation, more secure sealing, and safer testing for pipes constructed of a wide range of metallurgies and materials—even fiberglass-reinforced pipes can be reliably pressure tested with the GripTight MAX plugs.

If properly maintained in good working order, each plug can be reliably deployed in **50 to 100 pressure tests** before a seal needs to be replaced. Welded end caps, by contrast, may only be used a few times before they need to be scrapped and replaced. On modular construction projects, GripTight Test Plugs provide the lowest possible cost per test.

> *"The number of test packages we have completed has increased significantly. We are currently completing 60-65 test packages per week and are looking to increase this to 75 in order to meet our delivery commitments. In order to achieve this goal, the use of GripTight Test Plugs will be a key tool to reach these high test rates."*
>
> **José María Crespo**
> **Senior Project Director**

Streamlining Modular Construction

The owner of a large petrochemical plant project in the northeastern US and the EPC firm managing its construction employed a modular construction strategy for the majority of the plant, including the critical processing units and pipe racks. This strategy promises to shave months off the construction schedule compared to a site-built project approach.

However, the shift to modular construction poses a new set of hurdles for the EPC firm, including the significant increase in the number of pipe spool and piping system pressure tests that must be performed prior to transporting the completed modules to the site. The size of the project required the use of four separate module yards to complete the scope of work within the allotted timeframe.

One yard was contracted to build 74 process and pipe rack modules. Their scope called for over 3,600 individual pressure test packages to be completed successfully and promptly. With this number of tests to perform, the conventional testing method—welding on and cutting off end caps followed by beveling the pipe ends—would prove cost-prohibitive. Anything that the module constructor could do to shorten the time spent preparing for and performing each pressure test would save the project significant time and money.

EST Group proposed its GripTight MAX Test Plugs as a cost-saving alternative to welded end caps. While the same number of pressure tests would be required, the time-per-test would be significantly reduced, resulting in the time savings that the constructor and EPC firm needed. Convincing the EPC firm to try this strategy was simple enough, but getting the constructor, who was unfamiliar with testing plugs, to agree proved slightly more challenging.

Test Plugs ready for shipping

Many module yards consider the idea of adopting a new testing methodology, like test plugs, to mean a large upfront capital purchase—a situation that most yards try hard to avoid. EST Group had to demonstrate to the constructor that this upfront investment could save the yard money in the long run by driving greater efficiencies, speeding up their production, and meeting or shortening their delivery deadlines. As EST Group demonstrated with other module yards, such efficiency gains would put the constructor in a better competitive position to win future projects and keep their module yard full.

The constructor ultimately agreed to evaluate the test plugs. After a trial period that clearly demonstrated the plug's time-saving benefits, the constructor made a greater commitment to using test plugs across the board. The constructor delivered an initial list of specifications in early 2017, based on an analysis of the test packages to be completed for the modules that would ship first. EST Group carefully reviewed the requirements and delivered an estimate based on the type, number, and size of each test plug—both GripTight MAX and GripTight Elbow plug designs — that would be required for the project. The estimate also included any safety and support equipment that would be necessary for each pressure test.

The contractor placed their first order in mid-2018, which was broken down into two shipments. EST Group first shipped all plugs that were already available in inventory and then implemented expedited manufacturing to build the rest.

Because subsequent orders varied in their sizing, configuration, and delivery time, EST Group's New Build initiative had to be responsive and flexible. The company delivered test plugs for piping with IDs ranging from 0.5" to 40", and for both straight pipe sections and long radius elbows. One order for 85 test plugs had to be delivered from EST Group's manufacturing facility in Pennsylvania and exported to the constructor's module yard within 48 hours.

Production was continuous, with the overall project schedule at the module yard taking place over almost 24 months.

As modules were being fabricated, additional plugs were supplied to accommodate the different pipe sizes and test packages. EST Group kept pace with demand, manufacturing, shipping, and delivering the full complement of test plugs from the initial proposal in February 2017 to the last delivery in February 2019. "The number of test packages we have completed has increased significantly. We are currently completing 60-65 test packages per week and are looking to increase this to 75 in order to meet our delivery commitments," emphasizes José María Crespo, Senior Project Director. "In order to achieve this goal, the use of GripTight Test Plugs will be a key tool to reach these high test rates."

Proven Performance

Prior to this application, Trev-On, the subcontractor assigned to perform the pressure tests at the constructor's module yard, had performed pressure testing with welded-on end caps. The contractor initially expressed misgivings that the test plugs would not be as safe as the conventional welded plug method. However, after using the plugs in more than **3,600 tests without incident** (translating to 49 test packages per each of the 74 modules), they are now confident that GripTight MAX plugs are every bit as safe and reliable as welded end caps.

Trev-On prides itself on implementing state-of-the-art technological solutions that support the safe, secure, and cost-effective completion and testing of pipelines. The test plugs met these criteria, helping the contractor achieve improved productivity, lower testing times, increased test coverage, and faster drying times. Pressure tests were conducted in **20% to 25% of the time** typically required for welded end caps, with a peak completion rate of **55-65 test packages per week**. These efficiency gains helped expedite the testing process and keep the project timeline on schedule. "With the GripTight Test Plugs we test more with less set up time. We are now more focused on added value activities," explains Jorge Silvan, On-Site Superintendent at Trev-On. "No need of welding means time saving, which also means saving money! That is GripTight Test Plugs."

18" GripTight MAX Test Plug

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Jorge Silvan
On-Site Superintendent at Trev-On

Trev-On and the constructor realized further safety and performance benefits with EST Group's early project involvement. EST Group engineers provided on-site training and supervision to ensure the proper installation and safe operation of the test plugs. This included a review of the plug's operation and maintenance manual, training on the correct use of the torque wrench to set each plug, inspection and maintenance assistance, and round-the-clock availability to answer questions and troubleshoot potential problems.

Building on Early Successes

The successful delivery of all GripTight MAX and Elbow Test Plugs—on time and on budget—for this major petrochemical construction project proved the potential of the New Build initiative. EST Group learned a great deal about how to approach a new build project, which begins with building close collaborative relationships with all parties—the EPC, the module yards, and the other service providers. Such close relationships not only help EST Group's application teams thoroughly understand the project's key challenges and delivery goals, but it also helps the other parties understand how GripTight technologies (and other EST Group tools) can be used to provide optimal value.

While the constructor was originally going to hire multiple test plug and isolation tool manufacturers to handle the size and scope of this project, the early success of the New Build initiative convinced them to work exclusively with EST Group.

Armed with a newfound knowledge of the execution and economic challenges of new build projects, EST Group is committed to helping all project players – owners, EPCs, constructors, and module yards—achieve similar efficiency gains and cost savings in their high-dollar, high-risk projects.

GripTight Test & Isolation Plugs

GripTight MAX® Test Plugs

GripTight® Elbow Test Plugs

GripTight® Isolation Plugs

For more information, visit cw-estgroup.com. Contact us at est-sales-newbuild@curtisswright.com or +1 215.721.1100 / 800.355.7044 to speak with EST Group's New Build Team today!

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