

## **Semi-automated systems take water jetting to a new level**

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High-pressure water jetting (e.g., 10,000 psi to 40,000 psi) is both powerful and versatile, helping contractors and industrial companies do hundreds of challenging jobs. While many of those jobs are still done manually, more and more today are done by semi-automated systems that maximize three elements crucial to any company's success: productivity, safety and environmental responsibility.

Since water jetting uses nothing but water (no grit, solvents or chemicals), it has always been environmentally-friendly. And the latest high-pressure pump units make the process even "greener," reducing diesel engine emissions to just 10 percent of what the EPA allowed 20 years ago.

Specialized water jetting systems (more about these later) have been around for some time. But now manufacturers are also offering water jet

## **Keep risk at arm's length**



Since semi-automated systems are directed by remote control, or from a cab, they allow operators to keep their distance from the high-pressure water and any flying debris. This exposes the operator to less risk (and fatigue) than holding a high-pressure lance and makes it easier to comply with OSHA personal protective equipment (PPE) requirements.

Specially-designed tooling, mounted on a boom,



systems with multi-application capabilities. These typically have articulated arms mounted on commercial excavators, with changeable tooling designed to accomplish specific tasks.

gives an operator a wide jet pattern and a long reach (e.g. 12' vertical, 17' horizontal). The boom and tooling are easily manipulated from the cab, which also has start/stop controls for the high-pressure water. The cab is enclosed for protection while providing visibility of the work area.

In addition to reducing risk and fatigue, a semi-automated system usually provides more consistent water jetting results than several lance operators with varying experience or skill levels. And when the system is needed for a different job, the tooling is simply detached from the end of the boom and replaced with tooling more appropriate to the new application.

As the demand for boom-based water jet systems has grown, manufacturers have begun offering smaller versions for work in tight spaces. Some can fit through a 30" doorway. These operate the same as larger models, but have no cab; instead, they are directed from a remote control console. They also have smaller booms, and therefore a shorter reach.



## Faster tube bundle cleaning



Semi-automated water jet systems have been helping chemical plants and refineries improve productivity for many years. For example, high-pressure water jetting is a very effective way to blast hard deposits out of heat exchanger tube bundles, and to remove build-up from a bundle's exterior, or shellside. Years ago, an operator would manually feed a flexible lance into each tube in turn, and activate the water flow with a foot control.

The results of this process were inconsistent, and holding onto a pressurized hose for long periods was tiring. Furthermore, cleaning tubes one-by-one was time-consuming. So multi-lance systems were developed to clean several tubes at once, with options like automatic positioning, remote control, and hose reels to manage the high-pressure hoses and reduce the risk of trips and falls. These innovations reduced cleaning times by 75%.

Sometimes, however, processors need even higher productivity. In these cases, water jet systems are usually designed with rigid lances instead of flex lances. The rigid lances can be automatically indexed in and out to clean as many as five tubes at the same time. They can also incorporate a rotating action to polish the tube interiors while they clean.



Simple automated tube lancing (ATL) systems are generally air-powered or hydraulically powered. More sophisticated systems, like the ATL-5000 from NLB Corp., are diesel-powered and can include options like a climate-controlled operator station above the action. Water jet automation is also a very productive way to remove deposits from tube bundle exteriors. In a shellside cleaning (SSC) system, a robotic arm with spinning jets traverses the length of a tube bundle as it rotates, assuring complete coverage. In the photo below, ATL and SSC systems have been combined to take water jet automation to a new level.



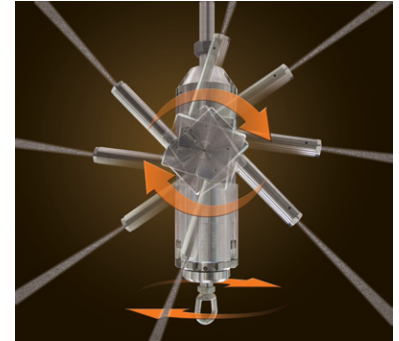
## Much less downtime for tank cleaning

Automated water jetting is also a popular choice for cleaning the tanks and reactors used for mixing and storing paints, chemicals, resins, and other challenging substances. The benefits are similar to tube bundle cleaning — fast, thorough cleaning without hazardous solvents, or abrasives that might damage the tank — with one big addition. Automation simplifies compliance with OSHA standards by keeping people out of confined spaces.

Here's how it works: a rotating 3-D head is inserted into the tank on a lance, where it can direct water jets at the interior walls. The reaction force of the high-pressure water causes the nozzles on the head to spin vertically while the

head rotates horizontally, resulting in complete, 360° coverage. The force of the water quickly cuts through any product on the walls, separating it from the surface.

How quickly can water jets clean a tank? One chemical company using reusable totes reports cleaning 110 per day instead of 55. Another reduced the time needed to remove a 7-inch layer of coke from a 25-foot tank from 100 hours to just 25. And another who switched to water jetting from another method slashed downtime to clean a 20,000-gallon tank by nearly 90 percent.



## Near-zero emissions and lower operating costs

Like any water jet accessory, semi-automated systems get the water pressure and flow they need from a specially-designed pump unit. Some models deliver a dedicated pressure (e.g., 20,000 psi or 40,000 psi), but many are convertible in the field to other pressures and flows, thus expanding the range of jobs they can do. Pressure, flow and horsepower have long been the three major criteria in water jet pump selection, but today there is a fourth: minimizing pollution.

For years, the Environmental Protection Agency (EPA) has been tightening emissions standards on diesel engines, including those that power water jet pump units. The regulations that took effect in January, 2015 — known as Tier 4F — are the most stringent yet. Emissions of nitrogen oxides (NOx) and particulate matter (PM) are now limited to just 10% and 5% of the levels allowed in 2006.

Compliance with these standards is mandatory in some parts of the United States, notably California, and is written into bid specifications and permits in various states and localities. Eventually, Tier 4F certification is expected to be a national standard.

Some engine manufacturers have introduced new technology to meet these tighter standards, and these engines are available on some water jet pump units. NLB Corp., for example, has over 350 low-emission units operating around the world and

recently introduced the UltraGreen™ series. These units are not only certified as Tier 4F-compliant, but can substantially reduce operating expenses.



**UltraGreen™**

The new engine technology in the UltraGreen series maximizes power generation from the fuel burned, significantly increasing its fuel economy. More torque is also generated with less horsepower, which means water jet pumps with smaller engines can do jobs that previously demanded bigger engines. A conservative estimate, based on figures from a leading engine manufacturer, shows that using a water jet unit with a 260 hp Tier 4F engine instead of a 350 hp Tier 3 engine can save a user \$12,400 a year.

## Summary

High-pressure water jetting has changed a lot in the past 50 years, and continues to innovate to meet user needs. Pumps can now generate pressures of 40,000 psi and higher. Convertible units are replacing dedicated units. And now there are models that help reduce air pollution while reducing operating costs.

Meanwhile, water jet tools (also called accessories) have moved beyond hand-held lances to semi-automated systems that prioritize operator safety as well as productivity. The end result is more uptime and cost-effectiveness — for chemical plants and anyone else faced with tough product removal challenges.

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NLB Corp. has been a water jet industry leader since introducing its first high-pressure unit in 1971. Its SPIN JET®, SPIN-NOZZLE®, and other patented developments have earned the company a global reputation for quality and innovation. NLB today offers more convertible water jet units (30)

than any other company, including the new UltraGreen Tier 4F-compliant units. It also has the broadest range of water jet accessories and semi-automated systems for maximizing productivity and operator protection.



*The Leader in High-Pressure  
Water Jet Technology*

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