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## TANKJET QUICK REFERENCE GUIDE

| Nozzle | Max. Tank Dia. ft. (m) | Operating Principle | Flow Rate gpm (lpm) | Operating Pressure psi (bar) | Spray Coverage | Min. Tank Opening in. (mm) | Max. Temp. °F (°C) | Recommended Strainer Mesh (micron) | Page No. |
|---|---|---|---|---|---|---|---|---|---|
| **TankJet 360**  | **100 (30.5)** | Fluid-driven turbine | 30 to 300 (114 to 1136) | 40 to 350 (2.8 to 24.1) | 360° | 6.25 (159) for 2 nozzle; 10.25 (260) for 3 nozzle | 250 (121) | 20 (840) | B4 |
| **TankJet AA290**  | | Motor-driven | 24 to 284 (91 to 1075) | 50 to 250 (3.4 to 17.2) | 360° | 7.25 (184) for 2 nozzle; 8.25 (210) for 4 nozzle | 200 (93) | 100 (150) | B6 |
| **TankJet 180**  | **80 (24.4)** | Fluid-driven turbine | 30 to 300 (114 to 1136) | 40 to 350 (2.8 to 24) | 180° | 12.25 (311) | 250 (121) | 20 (840) | B10 |
| **TankJet 80**  | **50 (15.2)** | Fluid-driven turbine | 53 to 142 (200 to 538) | 60 to 200 (4.1 to 13.8) | 360° | 6.5 (165) for 2 nozzle; 12.5 (318) for 3 nozzle | 250 (121) | 20 (840) | B12 |
| **TankJet 78 & 78D**  | **45 (13.7)** | Fluid-driven turbine | 65 to 165 (246 to 625) | 25 to 100 (1.7 to 6.9) | 360° | TJ78: 5.75 (146) TJ78D: 7.63 (194) | 200 (93) | 50 (300) | C4 |
| **TankJet 65 & 65HT**  | **40 (12.2)** | Fluid-driven turbine | 30 to 150 (114 to 568) | 50 to 150 (3.4 to 10.3) | 360° | 7.5 (190) | TJ65: 250 (121) TJ65HT: 500 (260) | 20 (840) | C6 |
| **TankJet AA190**  | | Motor-driven | 3.1 to 44 (11.8 to 167) | 100 to 1000 (6.9 to 69) | 180°, 360° | 3.75 (95) for 360°; 4.5 (114.3) for 180° | 200 (93) | 100 (150) | C8 |
| **TankJet YMD3**  | **30 (9.1)** | Motor-driven | 8.6 to 37.5 (32.6 to 142) | 725 to 4350 (50 to 300) | 360° | 3.75 (95) | 176 (80) | 100 (150) | C12 |
| **TankJet 75**  | | Fluid-driven turbine | 15.0 to 33 (57 to 125) | 75 to 300 (5.2 to 21) | 360° | 3.75 (95) | 250 (121) | 200 (80) | C14 |
| **TankJet 27500 & 27500-R**  | **10 to 25 (3.0 to 7.6)** | Fluid-driven reactionary force | 4.0 to 224 (15.3 to 850) | 10.0 to 50 (0.7 to 3.4) | 180° up/down, 270° up/down, 360° | 2 to 7 (51 to 178) | 200 (93) | 100 (150) | C16, D4, E4 |
| **TankJet 16**  | **24 (7.2)** | Fluid-driven turbine | 36 to 76 (136 to 288) | 50 to 200 (3.4 to 13.8) | 180° up/down, 270° down, 360° | 3 (76) | 250 (121) | 20 (840) | C18 |
| **TankJet 28500 & 28500-R**  | **18 (5.5)** | Fluid-driven reactionary force | 9.0 to 78.3 (34 to 296) | 10.0 to 50 (0.7 to 3.4) | 180° up/down, 270° up/down, 360° | 2.5 to 4 (64 to 102) | 200 (93) | 100 (150) | D6 |
| **TankJet 12900**  | **18 (5.5)** | Fixed stationary | 72 to 385 (280 to 1470) | 20 to 50 (1.4 to 3.4) | 360° and custom spray angles | 10 (254) | 212 (100) | 16 to 100 (1190 to 150) | D8 |
| **TankJet AA090**  | **16 (4.9)** | Motor-driven | 1.5 to 7.3 (5.7 to 28) | 100 to 500 (6.9 to 34.5) | 360° | 2.3 (59) | 200 (93) | 100 (150) | D10 |
| **TankJet D26984 & D40159**  | **10 to 16 (3.0 to 4.9)** | Fluid-driven constant speed | 3.2 to 19.8 (12.0 to 75) | 30 to 90 (2.1 to 6.2) | 65° down, 120° down, 180° up/down, 260° up/down, 360° | Thread: 2.25 (56) CIP version: 4 (102) | 160 (70) | 200 (74) | D14 |

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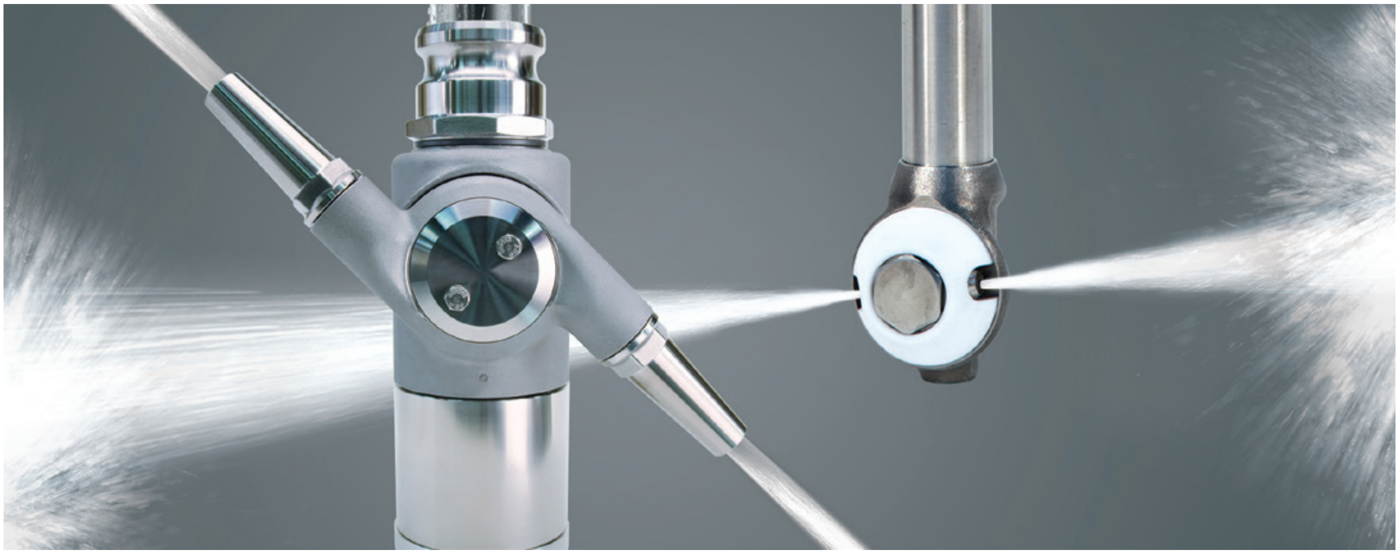
|---|---|---|---|---|---|---|---|---|---|
| **TankJet D41800E**  | **10 to 16 (3.0 to 4.9)** | Fluid-driven constant speed | 3.0 to 22.8 (11.0 to 86) | 30 to 90 (2.1 to 6.2) | 360° | 1.25 (32) | 265 (130) | 200 (74) | D16 |
| **TankJet D41990**  | **6.5 to 16 (2.0 to 4.9)** | Fluid-driven reactionary force | 2.4 to 37.4 (9.0 to 141) | 15.0 to 60 (1.0 to 4.1) | 180° up/down, 360° | Thread: 1 to 1.5 (25 to 38) CIP version: 2 to 4 (51 to 102) | 265 (130) | 200 (74) | D18, E10 |
| **TankJet 9 A, B & C**  | **6 to 16 (1.8 to 4.9)** | Fluid-driven reactionary force | 1.3 to 38 (4.9 to 144) | 10.0 to 120 (0.7 to 8.3) | 2 x 175°, 360° | TJ9-A: 1.25 (32) TJ9-B: 1.5 (38) TJ9-C: 1.75 (44) | 190 (88) | 20 (840) | D20, E14 |
| **TankJet 63225**  | **13 (4.0)** | Fixed stationary | 22 to 51 (83 to 192) | 15.0 to 40 (1.0 to 2.8) | 360° | 1.5 to 4 (38 to 102) | 400 (204) | 16 to 50 (1190 to 300) | D22 |
| **TankJet 14 & 19**  | **12 (3.7)** | Fluid-driven turbine | 10.0 to 30 (38 to 114) | 50 to 200 (3.4 to 13.8) | 180° up/down, 270° down, 360° | 2 (51) | 250 (121) | 20 (840) | D26 |
| **TankJet 6353 & 6353-MFP**  | **10 (3.0)** | Fixed stationary | 8.9 to 80 (35 to 301) | 20 to 50 (1.4 to 3.4) | 360° | 6 (152) | 212 (100) | 16 to 100 (1190 to 150) | E6 |
| **TankJet 18250A**  | **8 (2.4)** | Fluid-driven reactionary force | 10.5 to 55 (48 to 205) | 10.0 to 60 (0.7 to 4.1) | 360° | 2.38 (60) | 350 (177) | 200 (74) | E8 |
| **TankJet D41892**  | **6.5 (2.0)** | Fluid-driven reactionary force | 4.0 to 7.5 (15.9 to 29) | 20 to 70 (1.4 to 4.8) | 360° | 1.5 (37) | 160 (70) | 200 (74) | E12 |
| **TankJet M60**  | **5 (1.5)** | Motor-driven | 1.1 to 10.1 (4.2 to 38) | 100 to 1000 (6.9 to 69) | 360° | 1.75 (44.5) | 180 (82) | 100 (150) | F4 |
| **TankJet D26564**  | | Fluid-driven reactionary force | 2.4 to 5.4 (9.0 to 20.5) | 14.5 to 72.5 (1.0 to 5.0) | 180° up/down | 1.5 (37) | 194 (90) | 200 (74) | F6 |
| **TankJet 21400A**  | | Fluid-driven reactionary force | 5.0 to 22 (23 to 82) | 10.0 to 60 (0.7 to 4.1) | 360° | 2.25 (60) | 350 (177) | 200 (74) | F7 |
| **TankJet VSM**  | | Fixed stationary | 2.7 to 72 (10.4 to 269) | 10.0 to 150 (0.7 to 10.3) | 240° down | 2 (51) | 200 (93) | 50 (297) | F8 |
| **TankJet 30473**  | **3 (0.9)** | Fluid-driven reactionary force | 2.1 to 4.5 (7.8 to 18.0) | 10.0 to 50 (0.7 to 3.4) | 180° up/ down, 360° | 1 (25) | 200 (93) | 200 (74) | F9 |
| **TankJet 23240-2 23240-3**  | | Fluid-driven reactionary force | 3.5 to 22 (14.0 to 79) | 20 to 200 (1.4 to 13.8) | 360°, side spray | 1.03 (26) | 350 (177) | 200 (74) | F10 |



## CLEANING POWER GUIDELINES

Choosing a tank cleaner is based primarily on tank size and level of cleaning required. Understanding the definitions that follow will help ensure you select the right tank cleaner for your application.

**High-impact cleaning** is required to remove stubborn residues such as layers of a dried substance. Tank cleaners in this category generally use high pressure and/or high flow and spin at slow rotational speeds to maintain high impact. Solid stream nozzles are used to maximize impact.

**Medium-impact cleaning** is required when good impingement is needed to remove residues. Tank cleaners that provide medium impact generally use solid stream nozzles at medium flows and pressures. Rotational speed is slightly faster than high impact tank cleaners but much slower than free-spinning nozzles to ensure adequate impact on target areas.

**Rinsing** is used when distributing cleaning solution throughout the tank without impact provides sufficient cleaning. Rinsing nozzles are typically free-spinning or stationary spray balls.

## TANKJET® TANK CLEANER OVERVIEW BY TANK DIAMETER

The chart on the next page shows our tank cleaning products and the maximum and minimum tank diameter each unit can clean. The maximum tank diameter is defined as the total distance the spray can travel to tank walls assuming the unit is positioned in the center of the tank. The closer the nozzle is to the tank wall, the greater the impact. It is possible to use some tank cleaners in smaller tanks than recommended, but be sure to keep clearance, tank material and drainage capacity in mind.

## SPRAY DISTANCE

**Tank Diameter Range**

| Feet | 0.5 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 14 | 16 | 18 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meters | 0.2 | 0.3 | 0.6 | 0.9 | 1.2 | 1.5 | 1.8 | 2.1 | 2.4 | 2.7 | 3 | 3.7 | 4.3 | 4.9 | 5.5 | 6.1 | 9.1 | 12 | 15 | 18 | 21 | 24 | 27 | 30 |

| Product | Feet |
|---|---|
| TankJet® 360 | 100 |
| TankJet AA290 | 100 |
| TankJet 180 | 80 |
| TankJet 80 | 50 |
| TankJet 78 & 78D | 45 |
| TankJet 65 & 65HT | 40 |
| TankJet AA190 | 40 |
| TankJet YMD3 | 30 |
| TankJet 75 | 30 |
| TankJet 27500 | 25 |
| TankJet 16 | 24 |
| TankJet 27500 & 27500-R | 20 |
| TankJet 28500 & 28500-R | 18 |
| TankJet 12900 | 18 |
| TankJet AA090 | 16 |
| TankJet D26984 | 16 |
| TankJet D40159 | 16 |
| TankJet D41800E | 16 |
| TankJet D41990 | 16 |
| TankJet 9-C | 16 |
| TankJet 63225 & 63225-3A | 13 |
| TankJet 9-B | 12 |
| TankJet 14 & 19 | 12 |
| TankJet 6353 & 6353-MFP | 10 |
| TankJet 18250A | 8 |
| TankJet D41892 | 6.5 |
| TankJet 9-A | 6 |
| TankJet M60 | 5 |
| TankJet D26564 | 5 |
| TankJet 21400A | 5 |
| TankJet VSM | 5 |
| TankJet 30473 | 3 |
| TankJet 23240-2, 23240-3 | 3 |

## OPTIMIZING YOUR TANK CLEANING OPERATIONS

Tank cleaning equipment is designed to yield specific performance under specific conditions. A variety of factors can affect results. Even when tank cleaning equipment appears to be working as expected, there may be room for improvement. Adjustments are often possible to achieve more consistent results, improve efficiency, reduce the length of time tanks are out of service and lower operating costs.

**Here are seven optimization tips to consider as you evaluate the current performance of your tank cleaning equipment.**

### 1. HEATED WATER VS. IMPACT

Hot water is costly but may be needed to remove some residues. However, in some cases, hot water may be eliminated by increasing cleaning impact. This can result in a dramatic reduction in energy costs and savings of thousands of dollars annually. Ask your local sales engineers for assistance in determining if increasing impact can eliminate hot water use in your application. This may involve a proof-of-concept test to compare the cleaning performance of high impact vs. hot water.

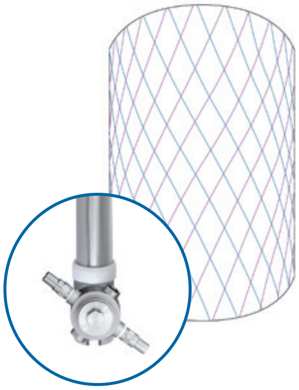
Don't try to evaluate impact without expert advice. Impact, or the amount of force the cleaning liquid applies to the tank surface, is difficult to measure. There is no industry standard for reporting impact data. Even though nozzles produce the same type of pattern, such as a solid stream, performance will vary based on how the nozzles were designed and machined.

### 2. OPERATIONAL CONSIDERATIONS

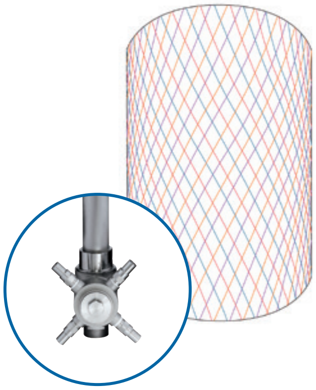
Two tanks that are the same size with the same residue may require completely different tank cleaners and cleaning times. For example, a 12 ft. (3.7 m) diameter tank used for paint mixing may be cleaned using a medium-impact tank cleaner with cycle times averaging 10 minutes if the paint residue is still wet. The same size tank may require a high-impact tank cleaner and take longer to clean if the paint has dried in the tank.

### 3. LOOK FOR ISSUES ASSOCIATED WITH "STRIPING"

High-impact tank cleaners that provide 360° cleaning coverage use solid stream sprays. These sprays don't overlap as they rotate, so there's a small distance between each path and striping occurs. The greater the distance the nozzles are from the vessel walls, the greater the distance between paths. In some operations, striping can be a contamination risk. Switching to a three- or four-nozzle configuration, rather than the standard two-nozzle configuration, is one way to reduce striping and minimize risk.



Striping effect with two-nozzle hub configuration



Striping effect with four-nozzle hub configuration

## 4. SHORTEN CLEANING TIME BY INCREASING IMPACT

Simple adjustments to liquid pressure and flow may enable a reduction in the number of cycles needed for thorough cleaning. Faster cleaning saves time and reduces water and chemical use. To increase impact and cleaning efficiency, it's far more effective to increase flow than liquid pressure since increasing flow rate intensifies impact at a greater rate than increasing pressure. In fact, doubling flow rate boosts impact as much as 100% while doubling liquid pressure provides only 40% more impact. In addition, there are other drawbacks to increasing pressure. Higher liquid pressures can introduce turbulence to the jet stream, reducing throw and cleaning efficiency.

**Relative Impact**

| Flow Rate | Liquid Inlet Pressure | Relative Impact |
|---|---|---|
| 13 gpm (49.2 lpm) | 45 psi (3.1 bar) | 1.0 |
| 13 gpm (49.2 lpm) | 90 psi (6.2 bar) | 1.4 |
| 26 gpm (98.4 lpm) | 45 psi (3.1 bar) | 2.0 |

## 5. CLEANING HARD-TO-REACH AREAS

Internal obstructions, like agitator shafts/blades, coils, etc., block the spray from hitting the tank wall. Certain areas, such as skim lines, require more cleaning than others. Having the flexibility to reposition tank cleaning equipment can help you achieve complete cleaning in less time and reduce operating costs. An adjustable ball fitting can be used to clean vessels in sections: Clean the top half of the vessel, then lower the device and clean the bottom half of the vessel, or change the angle to clean difficult locations.

Lances and adjustable flanges can also be used to help position nozzles properly. For example, if the tank only has a single entry opening, special lances and flanges can be used so the nozzle turret can be easily moved to multiple locations in the tank. Special lances and flanges can also be used to position nozzles so the spray impacts directly on heavily soiled areas or skim lines.

## 6. REVIEW SYSTEM COMPONENTS

In addition to the tank cleaner, other equipment can affect cleaning performance.

- ✓ **Pumps:** Check that you have the correct pump for your system. The efficiency of the pump will have a direct impact on flow and the performance of the tank cleaning equipment.
- ✓ **Piping and Valves:** Be sure pipes and valves are properly sized. Incorrect sizing can lead to inadequate flow, pressure and fluid velocity.
- ✓ **Filtration:** Confirm that required filtration products are installed. Filters or strainers should be properly sized and installed to prevent clogging.
- ✓ **Monitoring:** Ensure gauges or flow meters are placed in critical locations. System monitoring will enable quick detection and resolution of problems.

## 7. PERFORM REGULAR MAINTENANCE

After installing the tank cleaner, be sure to document performance to establish a baseline for later comparison. Also, be sure to inspect equipment on a regular basis. Verifying operation can be challenging since it is difficult to visually observe tank cleaning equipment while operating. Problems with tank cleaning equipment often become evident when trace amounts of residue are detected after cleaning.

Watch for debris build-up. Debris can clog nozzles, become embedded in bushings and gears and cause the unit to stop working or reduce service life. Even if you are just cleaning with water, rust or scale from piping may accumulate in the unit. Make sure to put your tank cleaners on a routine maintenance program to check bushings, seals, bearings and nozzles and make sure they are not worn or clogged.

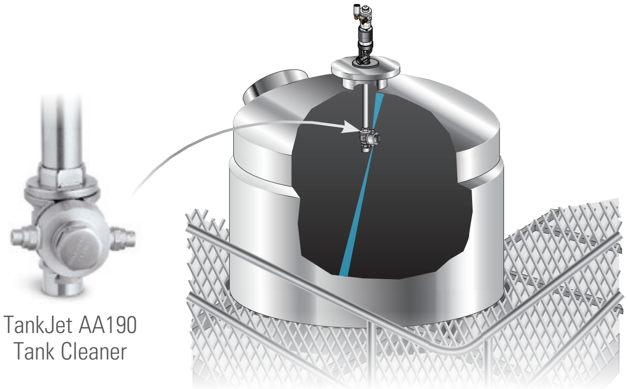
Be sure to document when service is done and how frequently components are replaced.

## OPTIMIZING TANK CLEANING WILL PAY FOR ITSELF QUICKLY. HERE ARE A FEW EXAMPLES:

### PHARMACEUTICAL MANUFACTURER REDUCES CLEANING TIME BY 80%

**Before:** Spray balls were used to clean two 6.25 ft dia. x 9 ft tall (1900 mm diameter x 2790 mm tall) processing tanks.

**After:** A TankJet® AA190, equipped with a 1 ft. (317 mm) shaft, operates at pressures up to 500 psi (34 bar) to provide high-impact, 360° cleaning. Even with stubborn residue, cleaning time has been reduced from 1 hour to 12 minutes.

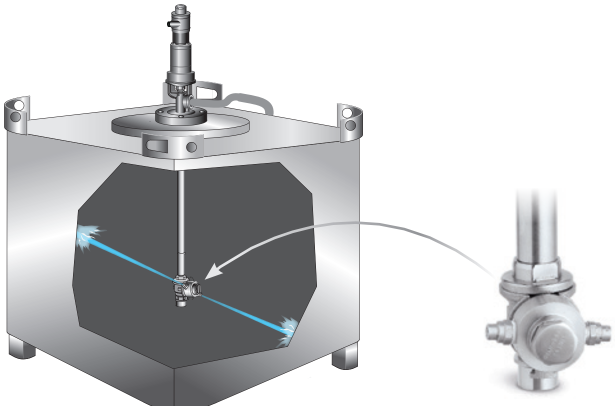


TankJet AA190 Tank Cleaner

### TOTE CLEANING TIME REDUCED FROM 45 MINUTES TO 10 MINUTES

**Before:** Turbine-driven rotating nozzle spraying hot water at 10 gpm (37.8 lpm) at 100 psi (6.9 bar). Wash cycle was often repeated a second time for complete removal of residue.

**After:** A TankJet AA190 now cleans the totes at 500 psi (34 bar) and a flow rate of 20 gpm (75.7 lpm). Operating at greater flow rates and higher pressures increases cleaning impact and results in cycle times of just 10 minutes.

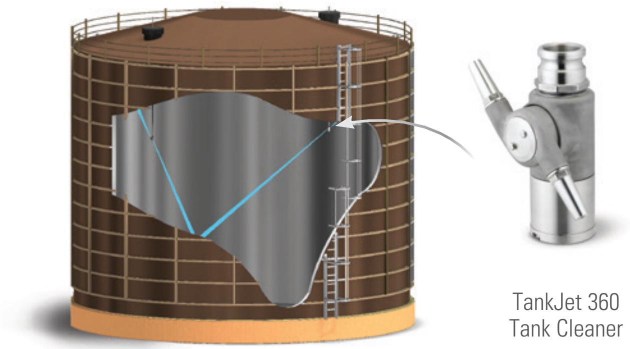


TankJet AA190 Tank Cleaner

### FERMENTER CLEANING TIME REDUCED FROM 45 MINUTES TO 20 MINUTES

**Before:** Tank cleaning nozzle operating at 40 psi (2.8 bar) required two cleaning cycles, extending cleaning time and increasing use of water and chemicals.

**After:** Two fluid-driven TankJet 360 tank cleaners, each with a two-nozzle hub, operating at 90 psi (6.2 bar) provide thorough cleaning of the fermenter in less than half the time. High-impact, high-efficiency 0.375 inch (9.5 mm) nozzles rotate 360° in horizontal and vertical planes, creating a criss-crossing pattern that thoroughly removes residue.



TankJet 360 Tank Cleaner

## CONSULT WITH EXPERTS

If you would like help optimizing your tank cleaning operations, our local sales engineers are always available for assistance and workshops at your facility. After evaluating your current operations and equipment, we'll offer optimization suggestions designed to achieve your specific cleaning objectives. More information on local sales services are available at **www.tankjet.com.**