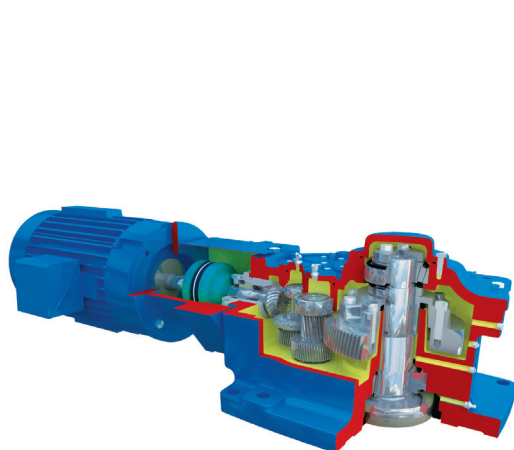
A low-angle, upward-looking photograph of an industrial facility. The image shows several large, white, cylindrical storage tanks with yellow safety railings. A complex network of silver metal pipes and walkways with perforated grates crisscrosses the upper portion of the frame against a clear blue sky with a few wispy clouds. The perspective creates a sense of height and scale.

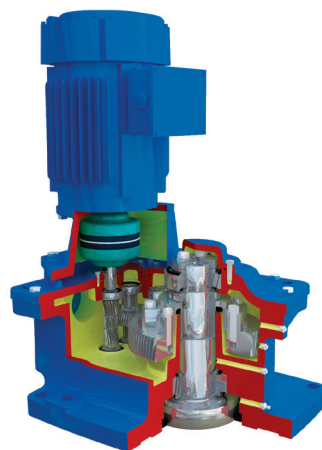
Chemineer™

Model 20 HT/GT Agitators





Model 20 HT



Model 20 GT

Premium Performance

The Model 20 HT/GT units feature a gearbox designed specifically for agitator service. Available in right angle (HT) and parallel shaft (GT) configurations, this rugged performer can be tailored to meet virtually any process, from critical chemical reactor systems to storage applications.

Combining the benefits of the HT and GT time proven agitators into a modular design package,

we provide solutions to optimize your mixing applications today and flexibility to handle your changing requirements in the future.

The Model 20 HT/GT is designed to meet AGMA, OSHA, ANSI, IEC, DIN, EU and ATEX standards and requirements.

How is the Chemineer Model 20 HT/GT Gearbox Superior?

Output Shaft Requirements

Commercial gearboxes usually have smaller output shafts that are poorly suited for agitator duties, leading to higher gear deflections, more noise and lower reliability. For optimum mechanical integrity, it is beneficial to design the low speed shaft so that the shaft diameter between the bearings is large and the distance between the bearings is small.

Commercial gearboxes tend to use smaller shaft diameters, resulting in the need to select larger and more expensive units to handle the bending moments associated with overhung loads.

The Chemineer Model 20 HT/GT also has an oversized output shaft, which reduces gear deflection and noise, with a true cast dry well seal to avoid the risk of leaking lubricant down the shaft.

AGMA Ratings when Applied to Agitators

The Chemineer Model 20 HT/GT gearbox is unique and superior because it is designed specifically for agitator duties.

AGMA established a general purpose standard intended to be applied to gearboxes used in a wide range of industrial applications. Agitators have particular duties that make reliance on AGMA service factors inappropriate.

A standard commercial gearbox tends to use smaller shafts and larger bearing spans that result in higher deflection, wear and shorter lifespan.

To obtain adequate drive life a high service factor must be applied. In comparison with a general purpose gear drive of the same nominal AGMA torque rating, the Model 20 HT/GT has much longer bearing and gear lives, which translate to lower maintenance costs and greater productivity.

Drive Features and Benefits

| | Features | Benefits |
|--------------------------------|---|---|
| Internal Shafting | Oversized low speed shaft diameter and short bearing span | <ul style="list-style-type: none"> • Time proven design to handle shaft/impeller bending loads • Reduces deflection and gear misalignment • Extends bearing and gear life |
| | Recessed low speed coupling half | <ul style="list-style-type: none"> • Simplifies installation with no requirement to install the extension shaft up through the gearbox |
| Gearing | Double and triple reduction options | <ul style="list-style-type: none"> • Double/triple reduction decreases gear loads • Lowers noise levels • Allows for non-synthetic lubrication over competitive single reduction designs |
| | Helical/spiral bevel (HT) and all helical (GT) | <ul style="list-style-type: none"> • Most efficient gearing available • Reduces energy costs |
| | Case carburized gearing | <ul style="list-style-type: none"> • Reduces wear rate for 20+ year service life |
| | Reverse rotation capability | <ul style="list-style-type: none"> • Available option for process flexibility |
| Housing and Lubrication | Cast gearbox housing | <ul style="list-style-type: none"> • Modular design with right angle (HT) and parallel shaft (GT) configurations • Reduces noise level |
| | Standard R&O oils and grease | <ul style="list-style-type: none"> • No synthetic lubrication is required • Saves installation and maintenance costs |
| | Bath lubrication | <ul style="list-style-type: none"> • Ensures vital lubrication to gears and bearings at all operating speeds • Eliminates internal/external lubrication pumps |
| | Cast dry well seal | <ul style="list-style-type: none"> • Eliminates lubrication leaks which are common in commercial gearboxes with no dry well or bolt on designs |
| | Extra seal over dry well | <ul style="list-style-type: none"> • Keeps oil out of dry well while moving gearbox |
| Bearing Design | Tapered roller output bearings with short bearing span, grease lubricated | <ul style="list-style-type: none"> • High capacity to handle bending and thrust loads • Provides long life |
| | Tapered roller/cylindrical roller bearings, oil lubricated | <ul style="list-style-type: none"> • Ensures cool operation • Ensures long life and low maintenance |



Installed Model 20 GTs at a wastewater treatment facility

Seal Features and Benefits

| Features | Benefits |
|--|--|
| Drop collar shaft support during seal change | <ul style="list-style-type: none"> • Shaft drops easily by loosening coupling bolts, and engages by tightening the coupling bolts • Shaft only drops 0.5" eliminating steady bearing disengagement • Allows for wetted parts to remain in place for seal change out |
| Optional throttle bushing and debris well design | <ul style="list-style-type: none"> • Clean fluid flush eliminates process build up in seal area improving seal life • Eliminates particle shedding from entering tank |
| Swing out or spacer spool seal change designs | <ul style="list-style-type: none"> • No need to pull shaft up through gearbox or in-tank shaft supports • No additional labor or parts required for special shaft support system • No lifting and removing of gearbox, saving labor and downtime |
| Variety of seal options from major mechanical seal vendors such as John Crane, Flowserve, Chesterton and AES | <ul style="list-style-type: none"> • Cartridge double and single seals, cartridge ChemSeals and stuffing box designs provide performance and flexibility to meet agitator sealing needs |
| Seal designs include cartridge single and double seals and split seals | <ul style="list-style-type: none"> • Reduces seal change out time and shaft wear as compared to non-cartridge (shaft mounted) designs |
| Low height pedestal (swing out) and seal bearing (spacer spool) design options | <ul style="list-style-type: none"> • Seal located close to shaft support bearings (swing out) and integral seal bearing (spacer spool) reduces shaft deflections at seal, improving life |
| Optional seal shut off device | <ul style="list-style-type: none"> • Eliminates operator exposure to hazardous vapors without draining the vessel |
| Jacks-n-Rails assembly available for large diameter seals | <ul style="list-style-type: none"> • Reduces labor time for seal change out with no extra hoists required |
| Optional lip seals and stuffing boxes | <ul style="list-style-type: none"> • Low cost lip seals available for low pressure applications • Self lubricating packing offers low maintenance sealing options for pressures up to 100 psi |



Swing out seal change

Sealing and Mounting Options

Open Tank

- **Drive Mounted to Beams**

Using a heavy duty, cast housing capable of handling maximum loads, the agitator mounts readily to support beams or similar structures for common open tank applications. Auxiliary seals are an option.

- **Pedestal Mounted to Beams**

The rugged, cast iron pedestal of the agitator raises the gear drive 10 to 14 inches away from the support structure to prevent exposure of the drive to the fluid and to facilitate service.

Closed Tank—Seal Options

- **Lip Seal**

The spring loaded, nitrile rubber lip seal protects process fluid from contamination in lower pressure applications.

- **Stuffing Box**

The six ring stuffing box utilizes standard PTFE/graphite-braided packing requiring no lubrication. Optional packing materials are available.

- **Single Mechanical Seal**

The single dry running mechanical seal is the economical choice where a pressurized barrier between the tank contents and the outside environment is not necessary.

- **Single Mechanical Cartridge ChemSeal**

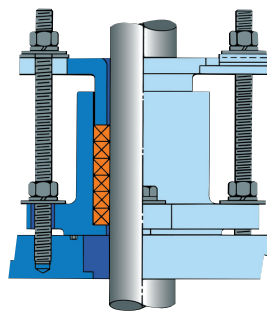
The single mechanical seal offers dry running capability with an easily replaceable cartridge.

- **Split Mechanical Seal**

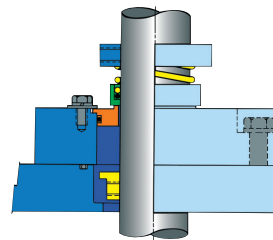
The two piece design simplifies installation and maintenance.

- **Double Mechanical Cartridge ChemSeal**

Double mechanical cartridge seals offer excellent sealing capabilities, long life and minimum maintenance. An appropriate barrier fluid keeps tank contents from escaping.



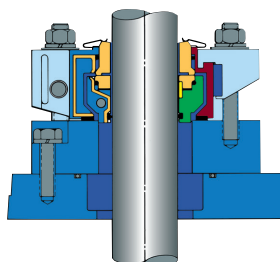
Stuffing Box



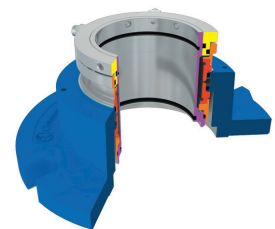
Single Mechanical Seal



Single Mechanical Cartridge
ChemSeal



Split Mechanical Seal



Double Mechanical Cartridge
ChemSeal

Shaft Design

Both process and mechanical considerations determine shaft design. Shafts are sized to resist torsional loads and bending moments induced by hydraulic forces acting on the impeller, as well as to avoid excessive vibration due to the coincidence of critical frequencies and operating speed.

Shafting is straightened to tight tolerances for long seal life and smooth operation — less than 0.003 inches total run out per foot of shaft length (0.25 mm per meter).

Custom couplings, impellers, shafts and steady bearings are available upon request, including sanitary designs.

Types

Shafting is supplied in a single piece design or in rigidly coupled sections for easy installation. For large diameter shafts, pipe shafting is a viable option with couplings and impeller hubs welded to the shafting. A wide range of materials and coating options are available.

Couplings

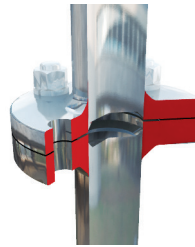
To facilitate assembly in the field, extension shafts are attached to the drive shaft with flanged rigid couplings, eliminating the need for shafts to be installed through the gearbox. Optional in-tank couplings can either be removable tapered bore or welded simplifying installation of long shaft agitators.

Steady Bearings

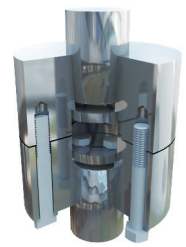
Steady bearings are available to help support extremely long shafts when requested or required. Tripod, bracket and pad type steady bearings are standard design options.

Extended Keyways

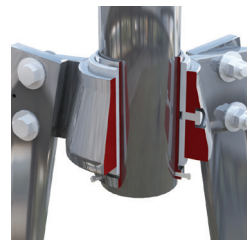
Extended keyways for adjusting impeller location offer process and design flexibility.



Welded Coupling



Removable Coupling



Tripod Steady Bearing



Bracket Steady Bearing

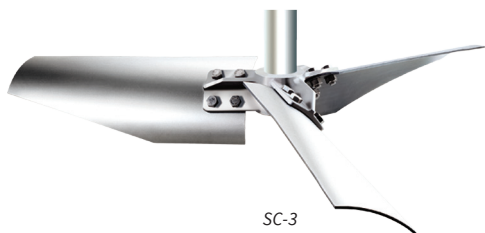


Installed Model 20 agitators on an oil rig

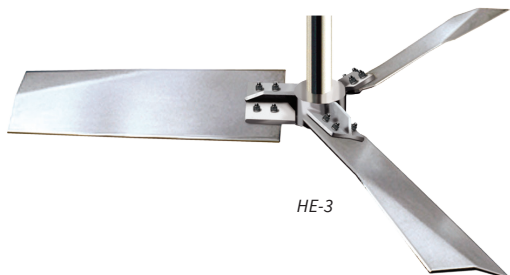
Impeller Technology

Our impeller technology is effectively applied across any spectrum of applications ensuring successful, repeatable results from lab scale to full scale operations.

Our mixing expertise includes high flow, low shear liquid-liquid agitation, solids suspension, gas dispersion, high shear blending and viscous mixing. Whether it is R&D or production phase, we have the expertise to solve your mixing challenges.



SC-3



HE-3



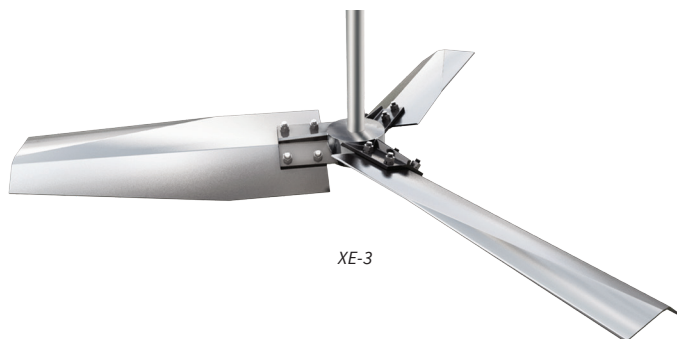
Maxflo W



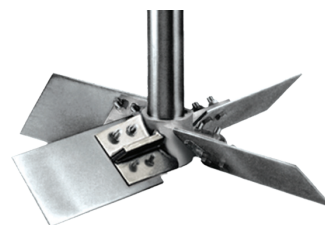
Helix



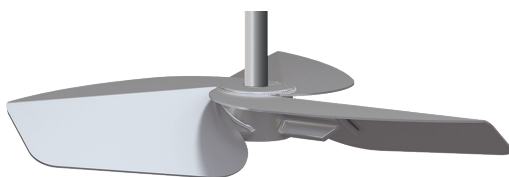
BT-6



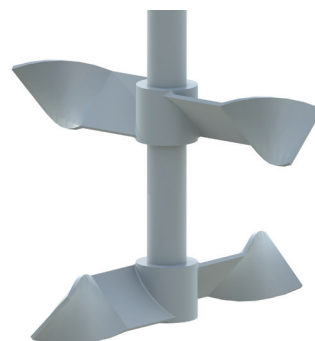
XE-3



P-4



RL-3



JT-2

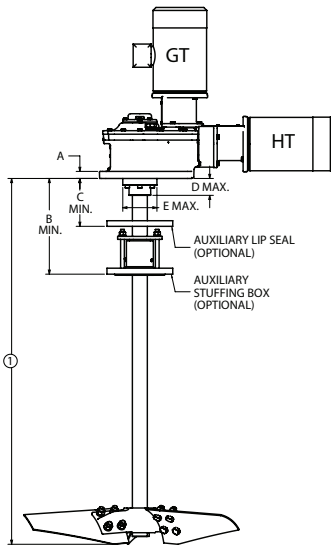
Dimensions

Agitator Dimensions

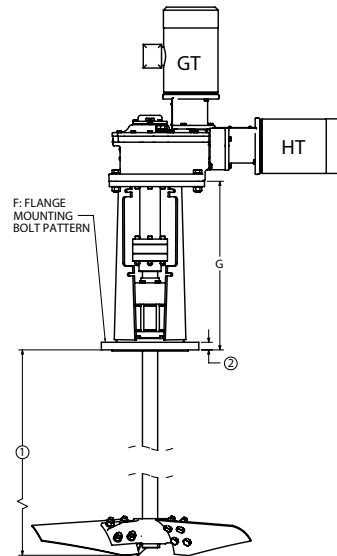
| Case Size | A | B | C | D | E | Bolt Pattern | Spacer | Swivel | H | J |
|-----------|-------|--------|-------|-------|-------|--|--------|--------|-------|--------|
| | | | | | | F | G | | | |
| 21GT | 1.18" | 13.94" | 6.94" | 2.94" | 5.71" | 8" — 150# ANSI (holes straddle center line) | 26.19" | 10.00" | 0.75" | 9.50" |
| 22GT | 1.38" | 18.00" | 8.00" | 4.00" | 7.48" | 10" — 150# ANSI (holes on center line) | 29.82" | 12.50" | 0.88" | 10.00" |
| 23GT | 1.58" | 18.63" | 8.63" | 4.63" | 9.45" | 12" — 150# ANSI (holes straddle center line) | 33.94" | N/A | 1.18" | 10.83" |
| | | | | | | 14" — 150# ANSI (holes straddle center line) | N/A | 14.06" | 1.46" | 12.80" |
| 21HT | 1.18" | 13.94" | 6.94" | 2.94" | 5.71" | 8" — 150# ANSI (holes straddle center line) | 26.19" | 10.00" | 0.75" | 9.50" |
| 22HT | 1.38" | 18.00" | 8.00" | 4.00" | 7.48" | 10" — 150# ANSI (holes on center line) | 29.82" | 12.50" | 0.88" | 10.00" |
| 23HT | 1.58" | 18.63" | 8.63" | 4.63" | 9.45" | 12" — 150# ANSI (holes straddle center line) | 33.94" | N/A | 1.18" | 10.83" |
| | | | | | | 14" — 150# ANSI (holes straddle center line) | N/A | 14.06" | 1.46" | 12.80" |

1 Agitator output speed, shaft diameter and extension, impeller design and other optional features to suit application

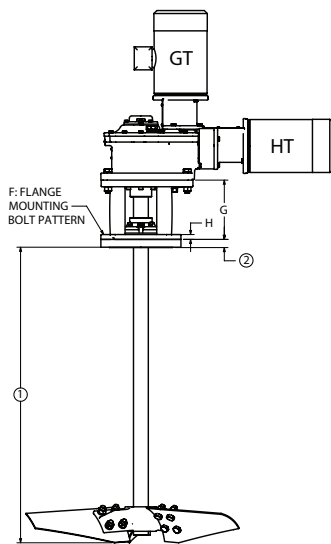
2 Alternate flange sizes are available



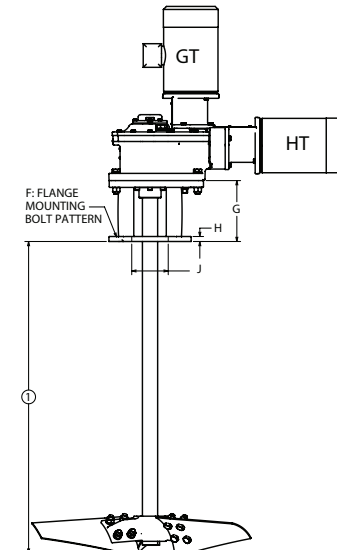
GT/HT D



GT/HT N
Spacer Spool



GT/HT A, L, N, NC, NS & NT
(N, NC & NS drives swivel)



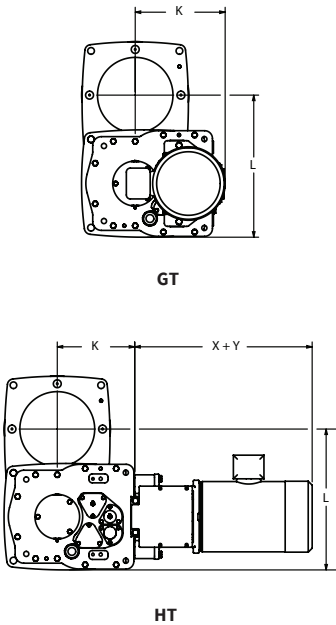
GT/HT P

Swivel Dimensions

| Case Size | K | L |
|-----------|--------|--------|
| 21GT | 11.18" | 17.57" |
| 22GT | 17.50" | 22.61" |
| 23GT | 21.90" | 28.31" |
| 21HT | 9.84" | 17.57" |
| 22HT | 12.56" | 22.61" |
| 23HT | 16.61" | 28.51" |

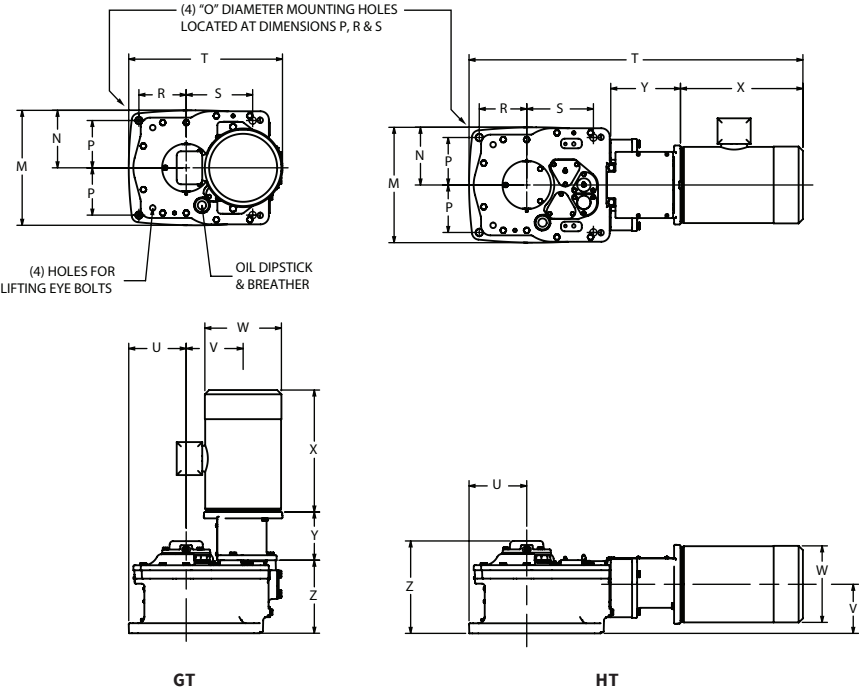
Typical Drive Assembly Swivel Dimensions

Drive assembly pivots at top of pedestal to allow change out of mechanical seals. See IOM for special motor conduit instructions.



Motor Dimensions

| Frame Size | | W | X | Y | | | | | |
|------------|-----|--------|--------|-------|-------|--------|-------|--------|--------|
| | | | | 21GT | 22GT | 23GT | 21HT | 22HT | 23HT |
| NEMA | 140 | 7.75" | 13.11" | 3.98" | — | — | 6.46" | — | — |
| | 180 | 9.25" | 16.24" | 5.51" | 6.02" | — | 7.99" | 9.41" | — |
| | 210 | 11.00" | 17.96" | 5.51" | 6.02" | — | 7.99" | 9.41" | — |
| | 250 | 12.75" | 22.25" | — | 6.85" | 7.01" | — | 10.24" | 11.43" |
| | 280 | 14.50" | 24.24" | — | 7.76" | 7.01" | — | 11.14" | 11.43" |
| | 320 | 16.88" | 27.00" | — | 8.23" | 8.27" | — | 11.61" | 12.69" |
| | 360 | 18.50" | 27.63" | — | — | 9.49" | — | — | 13.91" |
| | 400 | 20.88" | 31.75" | — | — | 10.83" | — | — | 15.25" |
| IEC | 80 | 6.61" | 10.66" | 3.85" | — | — | 6.06" | — | — |
| | 90 | 7.40" | 11.18" | 4.13" | — | — | 6.62" | — | — |
| | 100 | 7.72" | 13.15" | 4.92" | 5.35" | — | 7.40" | 8.74" | — |
| | 112 | 9.45" | 13.03" | 4.92" | 5.35" | — | 7.40" | 8.74" | — |
| | 132 | 10.61" | 16.73" | 5.39" | 6.22" | 6.10" | 7.88" | 9.61" | 10.52" |
| | 160 | 12.52" | 21.26" | — | 7.87" | 7.48" | — | 11.26" | 11.90" |
| | 180 | 14.37" | 23.31" | — | 7.87" | 7.48" | — | 11.26" | 11.90" |
| | 225 | 17.64" | 30.51" | — | — | 9.53" | — | — | 13.95" |
| | 250 | 20.00" | 35.04" | — | — | 9.53" | — | — | 13.95" |
| | 280 | 22.17" | 38.39" | — | — | 9.53" | — | — | 13.95" |



Drive Assembly Dimensions

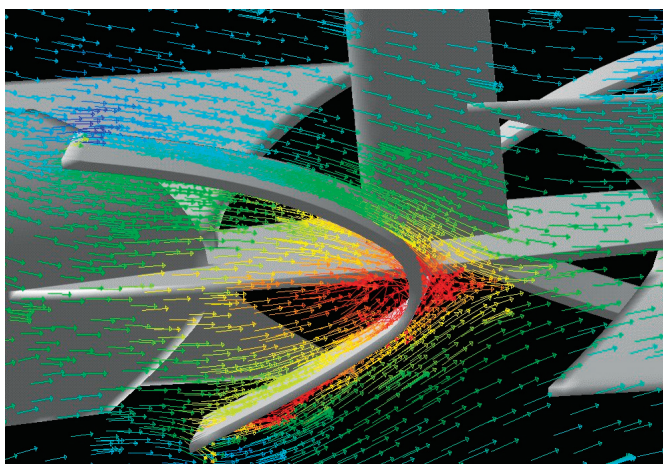
| Case Size | M | N | O | P | R | S | T | U | V | Z |
|-----------|--------|--------|-------|-------|-------|--------|--------|-------|--------|--------|
| 21GT | 12.77" | 6.45" | 0.84" | 5.56" | 5.56" | 7.81" | 17.91" | 6.73" | 6.69" | 8.47" |
| 22GT | 16.97" | 8.48" | 1.00" | 7.06" | 7.06" | 10.06" | 26.00" | 8.50" | 9.06" | 10.75" |
| 23GT | 21.97" | 10.99" | 1.00" | 9.65" | 7.68" | 2.17" | 31.15" | 9.25" | 11.41" | 14.80" |
| 21HT | 12.77" | 6.45" | 0.84" | 5.56" | 5.56" | 7.81" | 38.75" | 6.73" | 5.75" | 10.83" |
| 22HT | 16.97" | 8.48" | 1.00" | 7.06" | 7.06" | 10.06" | 59.70" | 8.50" | 7.23" | 12.91" |
| 23HT | 21.97" | 10.99" | 1.00" | 9.65" | 7.68" | 2.17" | 73.47" | 9.25" | 9.77" | 16.50" |

Chemineer Advanced Design Initiative

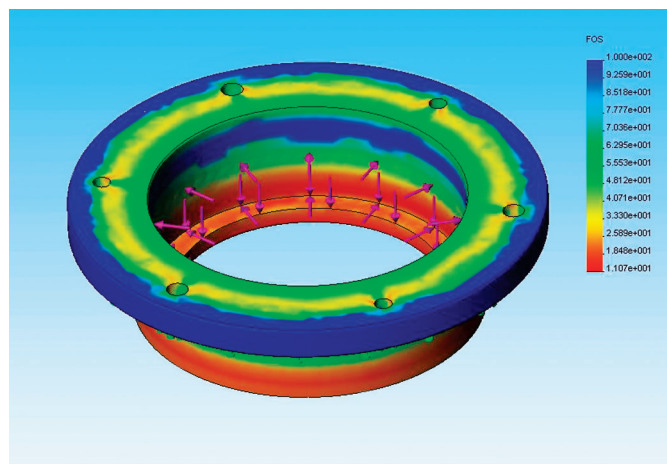
The Chemineer Advanced Design Initiative brings proven technical expertise to each mixing solution, from basic mixer and impeller design through complex process application analysis. Continuing research in both mechanical and process aspects of mixing allows us to provide high quality and high value products and services. Combined with proprietary data evaluation methodology and extensive field experience, we provide the most accurate application evaluation possible. Let us optimize your application, saving you time and money, by applying our experience and state of the art tools, such as:

- High tech customer test laboratory—offers the most advanced testing techniques in the industry specific to your process

- R&D laboratory—provides advanced process and mechanical research which is incorporated into custom design packages to optimize your application
- Computational Fluid Dynamics (CFD)—provides visual projections of mixer performance by generating a series of mathematical models of fluid flows
- Digital Particle Image Velocimetry (DPIV)—provides instantaneous flow visualization and quantitative measurement of the fluid velocity field
- Laser Doppler Anemometry (LDA)—corroborates time averaged DPIV data, especially for velocity fields in the vicinity of the impeller
- Laser Induced Fluorescence (LIF)—enables the user to gain a fundamental understanding of mixing by tracking the path and diffusion of injectants in agitated vessels and static mixers
- CEDS™ (Chemineer Expert Design System)—the industry leader in agitator design and analysis software. This proprietary program suite optimizes process performance, in addition to mechanical integrity, strength and reliability
- ChemScale™—the industry standard method for effective mixer selection that helps to optimize the agitator design for your specific process needs
- Finite Element Analysis (FEA)—dynamic vibrational and stress analysis of vessel and agitator support structures ensures proper design to handle agitator loads. Product design tool for stress and deformation analysis ensures product safety and reliability
- CAD and SolidWorks 3D Design—state of the art product and job design software, with customer specific mixer drawings available
- A library of technical articles—available on our website



Example of CFD modeled flow fields



Example of FEA analysis

Aftermarket Parts and Services

At NOV we offer customers immediate assistance to help achieve operating performance goals for agitation and mixing processes. This is accomplished in two ways: ensuring replacement parts and services are available in a timely manner to increase the “uptime” of your systems, and ensuring customers are offered the latest technology to improve the performance of agitation and mixing systems.

The Right Part Every Time

We provide drop in replacement parts of standard and custom Chemineer agitator components, minimizing installation problems like improper fit up or alignment. Chemineer replacement parts are made to original equipment specifications to ensure maximum reliability of your mixing equipment.

Technical Support

Our technical support is just a phone call away. Whether you need assistance with installation, startup, maintenance, or replacement parts, our technical experts are ready to help.

Field service technicians are ready to assist your crew with installation, troubleshooting, reliability audits, or maintenance and operator training in your facility.

Installation

We offer expert help on installation, whether your application requires one or multiple agitators. Field service technicians can quickly and efficiently supervise the installation and start up of your agitator or complete the installation from start to finish.

Authorized Service Centers

We offer multiple options to get your process back up and running. Highly trained field service technicians are ready to deploy for assisting maintenance crews in repair, diagnostic, and/or maintenance work. An authorized service center is located near your plant for quick responsiveness backed by the full support of our manufacturing facility.

Our field service technicians can also perform repairs and maintenance on site. Service agreements are available for routine maintenance services to keep your equipment operating at optimum performance levels. While on site, our team can perform reliability audits to review your current mixing equipment and provide recommendations

for mechanical and process improvements and critical spares planning.

The service centers located at our manufacturing facilities are utilized for more extensive failure analysis, fast replacement parts assemblies, and the most reliable agitator repair service in the world. New and refurbished parts options are available to suit your business requirements and get equipment back into operation.

We offer customer service plans tailored to fit your needs. Contact your local representative or call us directly at 937-454-3200.

Parts

Our large inventory supports your stock and provides quick fulfillment of maintenance and repair needs. Emergency stocked parts are shipped within 24 hours. In addition to a wide selection of standard replacement items such as bearings, seals and motors, we stock complete drives and internal subassemblies. Our drive exchange program offers a replacement drive for rapid conversion for Chemineer and competitive drives.

Warranty

For added peace of mind the Model 20 HT/GT agitator is backed by a comprehensive product warranty.

Emergency Hotline:
+1 937 926 1724



Experienced field service technician repairing equipment on site to minimize downtime

Chemineer

Chemineer is a leading provider of mixing solutions for the oil and gas industry.

Our products are designed to provide efficient mixing and blending of liquids and solids.

For more information, please contact your local Chemineer representative.

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