

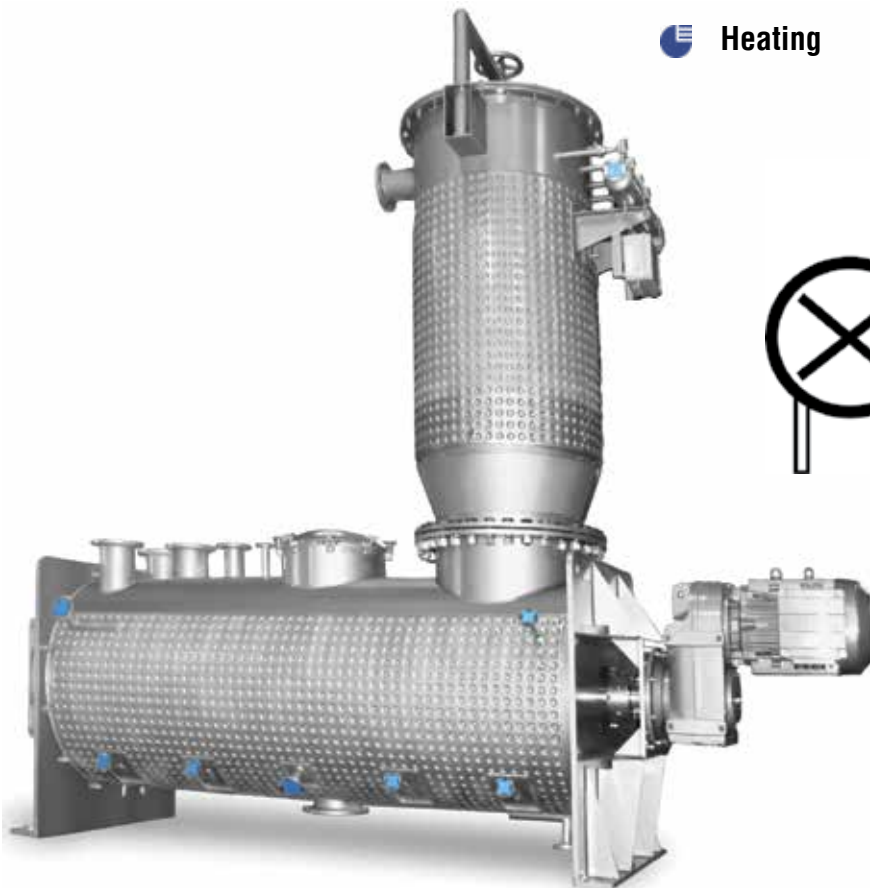


Dryer / Reactor

Equipment & Systems



-  Mixing
-  Drying
-  Reacting
-  Cooling
-  Heating



Thermal Processing Equipment & Systems

EIRICH Machines, Inc. offers best-in-class custom thermal processing equipment and systems for lab to high volume production. Mixing, drying, reacting, heating, cooling, or any combination thereof can be achieved in a single, all-in-one mixer eliminating the need to use multiple pieces of equipment to achieve the same desired result. We offer a wide variety of configurations suitable for the most demanding applications.

American Process Systems® (APS) dryer / reactors are ideal for mixing solids to solids, liquid to solids, or even solids to liquids in a wide variety of industries, including food and beverage, pharmaceutical, chemical and plastics. Drying, reacting, heating and/or cooling can be carried out in a single APS horizontal cylindrical vessel. The vessel and jacketing is ASME certified for pressure and/or vacuum. We offer a variety of mixing tools to optimize your process such as fluidizing paddle, plow or heat transfer plow. High-speed choppers can be incorporated to improve application efficiencies. We offer clover, tulip and x-mas stack as chopper tools. Product can be heated and/or cooled during dynamic mixing either through conduction (indirect contact - i.e., steam jacket) or through convection (direct contact - i.e. steam injection).

EIRICH Machines' extensive knowledge, coupled with the industry's most comprehensive line of mixing equipment, allow us to confidently design and fabricate your mixing and blending equipment to optimize your product and achieve the results you are looking for.

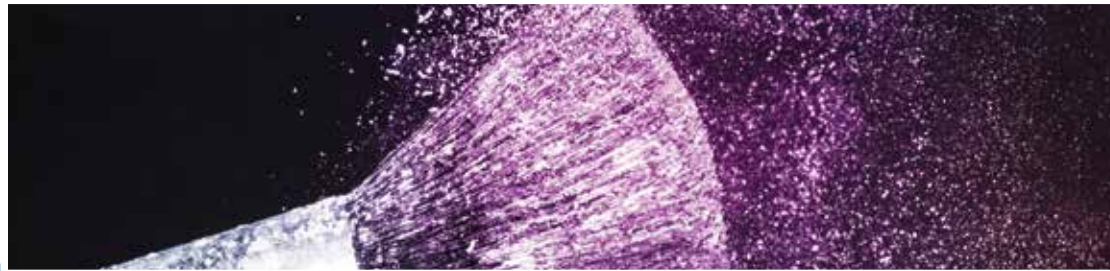


200 ft³ Vacuum Dryer / Reactor with half-pipe jacketed mixing vessel, 2205 duplex stainless steel and electrically heated dust collector (application)

Applications & Processes

| | | | | |
|---------------------|--|---|--|---|
| Applications | <ul style="list-style-type: none"> • Agriculture • Biomass | <ul style="list-style-type: none"> • Chemical • Environmental | <ul style="list-style-type: none"> • Food Beverage • Nutraceutical | <ul style="list-style-type: none"> • Pharmaceutical • Plastic/Rubber |
| Processes | <ul style="list-style-type: none"> • Agglomerating • Coating • Cooling • Crystallizing | <ul style="list-style-type: none"> • Dispersion • Drying • Extracting • Evaporating | <ul style="list-style-type: none"> • Encapsulating • Granulating • Heating • Hydrating | <ul style="list-style-type: none"> • Mixing • Pasteurizing • Reacting • Sterilizing |
| Materials | <ul style="list-style-type: none"> • Pastes • Powders | <ul style="list-style-type: none"> • Press Cakes • Sludges | <ul style="list-style-type: none"> • Slurries • Solvent-Based | <ul style="list-style-type: none"> • Suspensions • Water-Based |

*On The Cover: 90 ft³ vacuum dryer with jacketed mixing vessel and dust collector / davit arm assembly, manhole, site glass, nitrogen ports and temperature probe port (drying calcium carbonate).



EIRICH Machines' Equipment

Vacuum Drying

Vacuum drying is a very efficient and cost effective method of removing solvent(s) from a product at a reduced pressure. Applying vacuum to the vessel lowers the boiling point (vaporization point) of the solvent(s). For example, water boils at 212°F under standard atmospheric conditions. By lowering the atmospheric pressure to 25.5" HgV, water will now boil at 130°F. The vapor is condensed downstream where it can be re-claimed, chemically treated, or re-purposed.

Our batch vacuum dryer mechanically fluidizes the product ensuring an efficient and gentle mixing process. The fluidization individualizes the particles of the product to increase the available exposed surface of the product particle. This increased surface exposure improves heat transfer and thus the drying cycle. High speed choppers fitted to the side of the vessel can be incorporated to break agglomerates to facilitate exposure of the surface area of the particle.

Heat transfer is typically achieved through conduction (indirect transfer) with an ASME certified jacket constructed on the outside of the vessel. Typical media is steam or thermal oil. Other media may include water or electric.

Vapor is filtered through a pulsing bag filtering chamber to retain solids within the dryer.



45 ft³ vacuum dryer / reactor with jacketed mixing vessel, dust collector and auto sampler (application)



Plow agitator with X-mas tree style choppers

Advantages

- Faster drying at a lower temperature
- Greater process control flexibility
- Prevents degradation of temperature sensitive products
- Prevents oxidation of sensitive products
- Prevents microbial growth
- Dust-free end product
- Low PPM gas-assisted drying
- Lower energy consumption
- Environment-friendly preparation process
- Deaerates product to improve aesthetics or increase strength (eliminates voids)

EIRICH Machines' Equipment

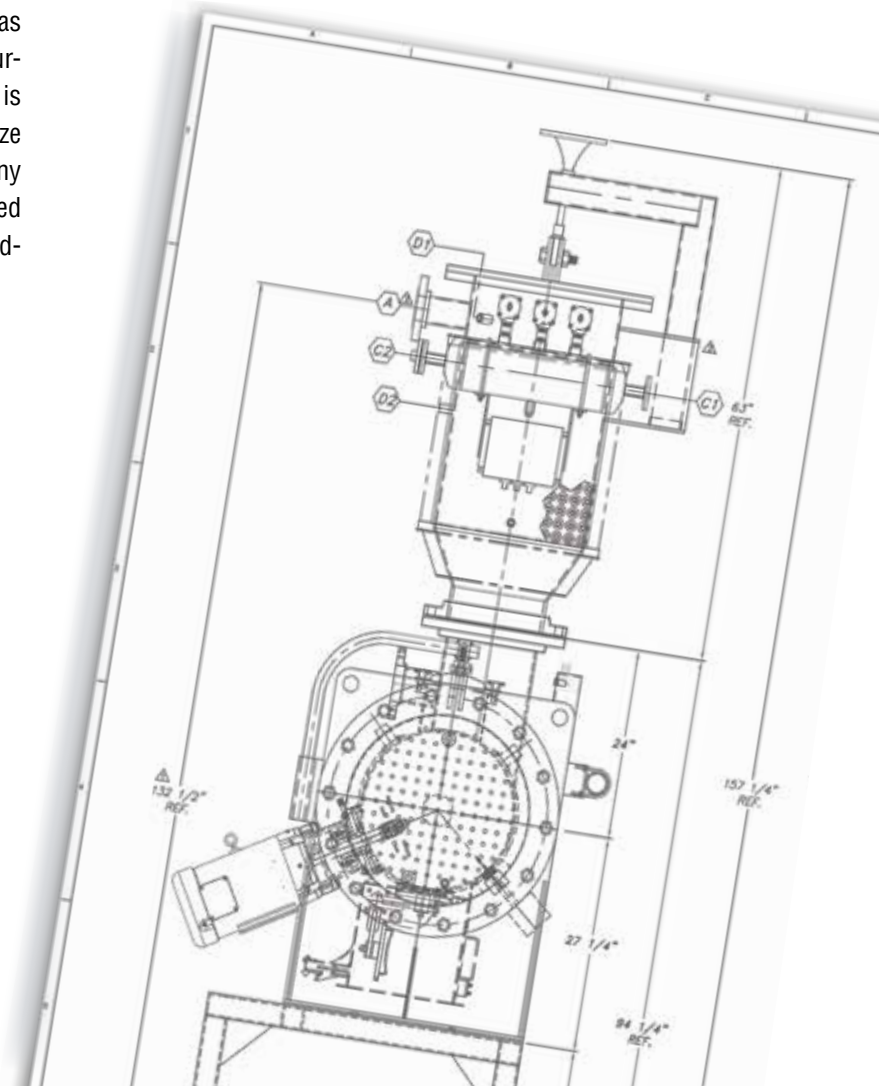
Reacting

Reacting is also a very efficient and cost effective method for synthesizing/processing a product with elevated temperatures and pressures. A reaction can be conducted at higher temperatures (the boiling point of a solvent is elevated at higher atmospheric pressures), driving the reaction faster and to higher conversion with fewer competing side reactions. The sealed unit eliminates lost solvents/reactants. The reaction can be performed in an inert atmosphere. The resulting product can then be dried under vacuum in the same vessel. The reactor provides a complete solution for reactions, drying, pressure cooking, sterilization (heat and/or alcohol) or extractions.

Our batch reactor mixes in much the same way as the vacuum dryers. The agitator mechanically fluidizes the reactants ensuring intimate contact with each other as well as frequent contact between the heat transfer surface and the product particle. The fluidizing action is independent of the solid particle's density, physical size and characteristics. Reactions can be carried out in any combination of solid, liquid and gas phases. High speed choppers mounted to the side of the vessel provide additional shear and mixing.



45 ft³ reactor with jacketed mixing vessel, Kynar[®] coated carbon steel and Hastalloy components (corrosive rubber reclamation).



Advantages

- Faster reaction to completion
- Greater process control flexibility
- Prevents oxidation of sensitive products
- Reduced competing side reactions
- Dust-free end product
- Low PPM gas-assisted drying
- Retention of volatile reactants
- Environment-friendly

Typical Dryer/Reactor System

All-In-One Thermal Processing Equipment

Mixing, drying, reacting, heating or cooling, or any combination thereof can be achieved in a single all-in-one mixer eliminating the need to use multiple pieces of equipment to achieve the same desired result. We offer a wide variety of configurations suitable for the most demanding applications.

Instrumentation/Controls

State-of-the-art controls systems including: PLC's, HMI's, sequential programming, variable frequency drives (VFD's), soft starters, trending, data logging, hazardous location & intrinsically safe design.

Heavy Duty Mixing Vessel

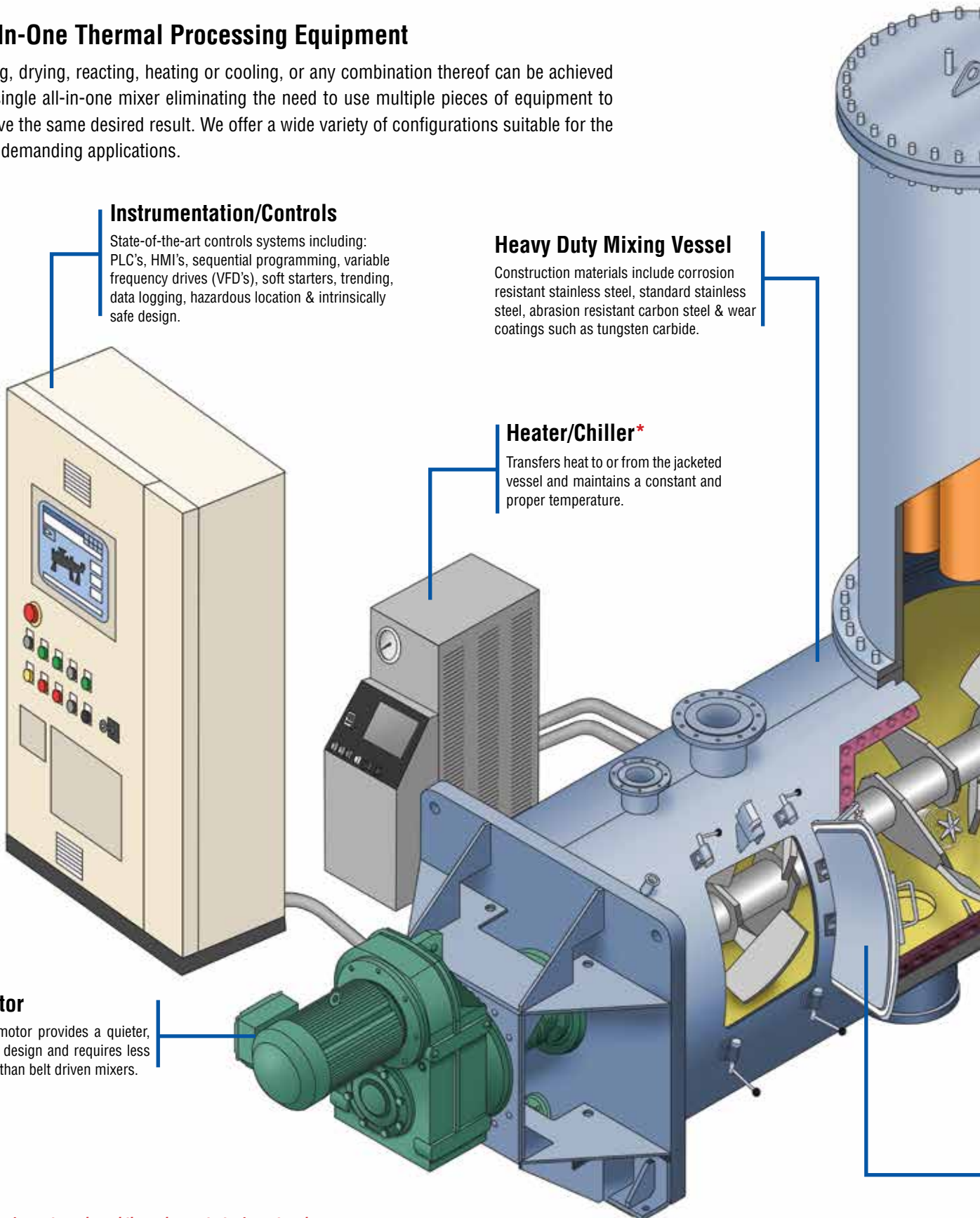
Construction materials include corrosion resistant stainless steel, standard stainless steel, abrasion resistant carbon steel & wear coatings such as tungsten carbide.

Heater/Chiller*

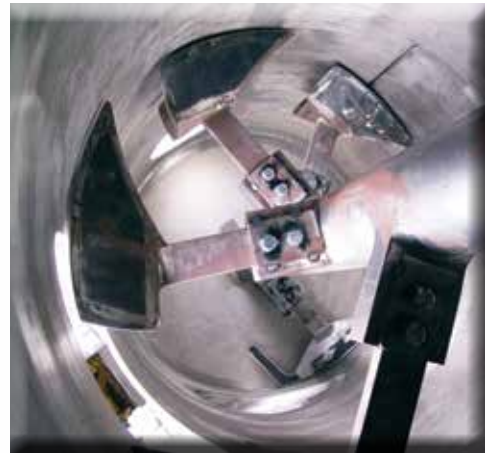
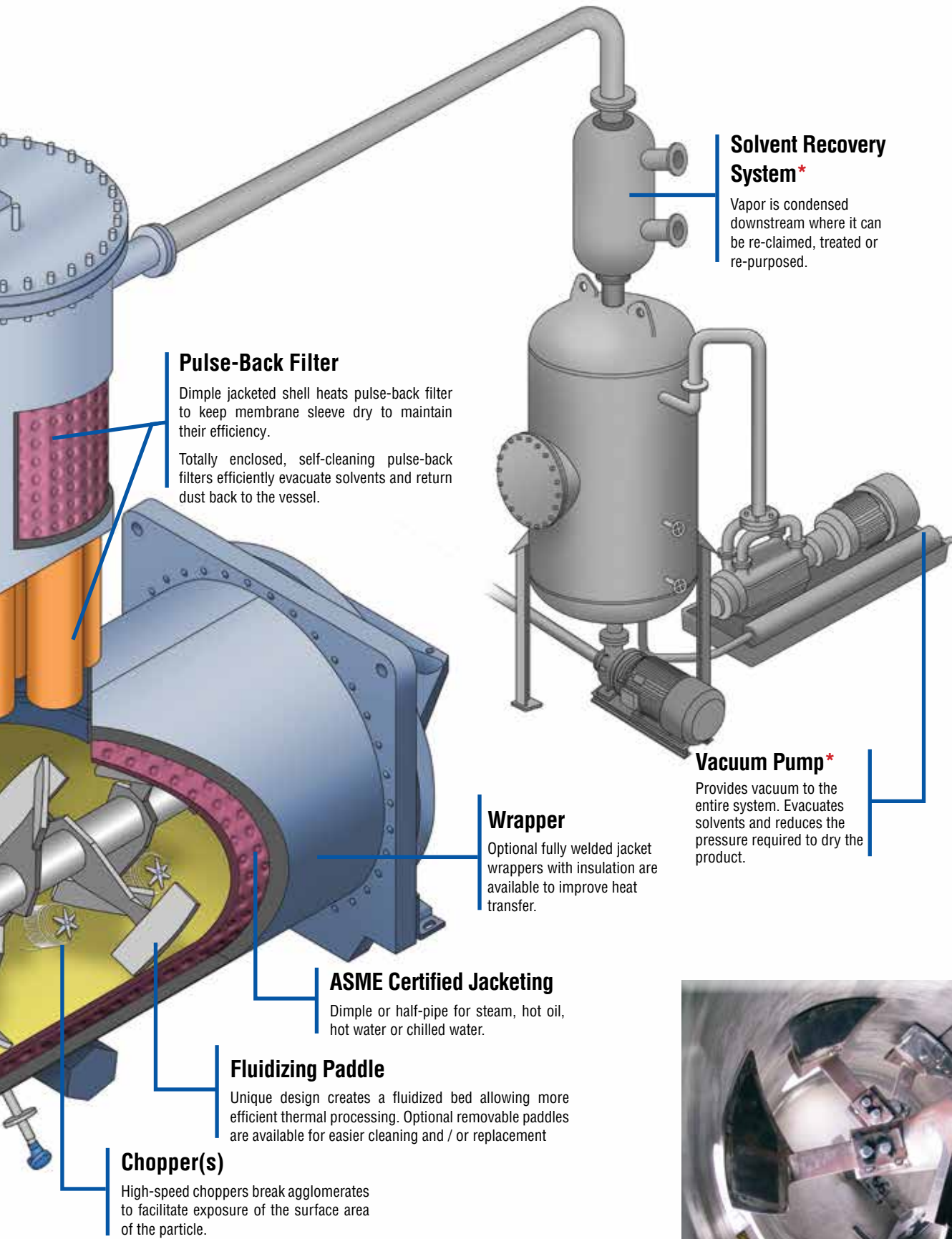
Transfers heat to or from the jacketed vessel and maintains a constant and proper temperature.

Gear Motor

Direct drive motor provides a quieter, more reliable design and requires less maintenance than belt driven mixers.



* Denotes equipment purchased through our strategic partner base



Plow style paddles with removable arm for economical cleaning and replacement.

EIRICH Machines' Systems

Your One-Stop-Solution in Bulk Solids Handling & Processing

EIRICH Machines provides a variety of innovative turnkey systems for both the hygienic and industrial markets. Our vertically integrated structure, with end-to-end product development and manufacturing capabilities, is a major advantage to our customers.

By providing a seamless process, with optimized communication and efficiencies every step of the way, we're able to help companies produce a better product and achieve their business goals. Systems and installation centering on Eirich Machines core products include weighing, conveying, platforms, control systems, data recording and factory accepted testing (FAT).



Design / Plant Engineering

EIRICH Machines offers a wide range of plant design solutions for material processing including planning, designing, specifying, installing, modifying and maintaining plant facilities. Successful system installations include new projects, conversions, modernizations, expansions and optimizations.



Project Management

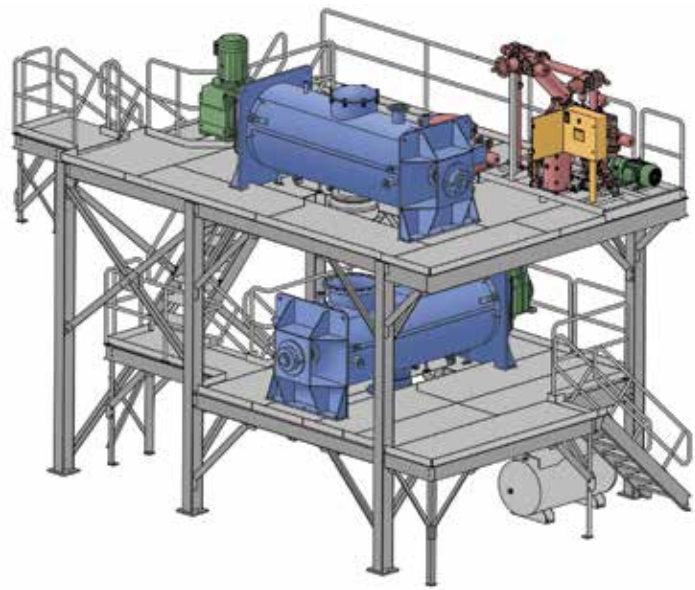
EIRICH Machines assigns a project manager to each project who routinely communicates each phase of the project to ensure that you are properly informed and satisfied with our project performance.



Laboratory Trials / Material Processing

Our state-of-the-art laboratory provides proof-of-concept testing allowing EIRICH to successfully demonstrate the optimum process parameters and the correct type of equipment required for your application. All new and customer-specific applications are validated and documented in production tests using the customers' original materials.

Model CPB-45 jacketed vacuum dryer/reactor and jacketed vacuum dryer/reactor cooler, electronic control panel, platform and solvent recovery system



Manufacturing / Quality

EIRICH Machines will continuously provide high quality products and services to meet customers' expectations. EIRICH Machines is a ISO 9001:2015 certified company providing material processing solutions and equipment and systems. Register No. C0284632-1S6.



Installation

EIRICH Machines has a full range of staff capable of assisting with factory and site acceptance tests, new installations, conversions, modernizations, expansions, optimizations and training.



Customer Support

EIRICH offers an extensive service portfolio to support our equipment and systems which includes original spare parts, rebuilds and service. All service engineers and technicians are direct employees of the company.



Applications

Market

Applications

Nutraceutical / Pharmaceutical



- Coating medications to control release dosage
- Coating medications to improve taste
- Crystallization active pharmaceutical ingredients (API's)
- Mixing and agglomerating dietary supplements
- Mixing milk powders for infant formula, supplement drinks and protein powders

Fine and Specialty Chemicals



- Drying minerals for flame retardants
- Drying solvents to wash inks
- Drying solvents to extend shelf life of adhesives
- Mixing, cooling and thermal reacting of multiple components to produce fine chemicals

Plastic / Rubber / Ceramic



- Drying plastic powders
- Coating plastic granules

Environment



- Moistening of fly ash from power plants for disposal
- Extracting mercury from natural gas
- Removing contaminants from waste water
- Mixing, heating and extracting glycerin from waste vegetable oils and fats to produce bio-fuels
- Conditioning of sludges from sewage treatment plants
- Conditioning of radioactive waste from nuclear power plants

Food / Beverage



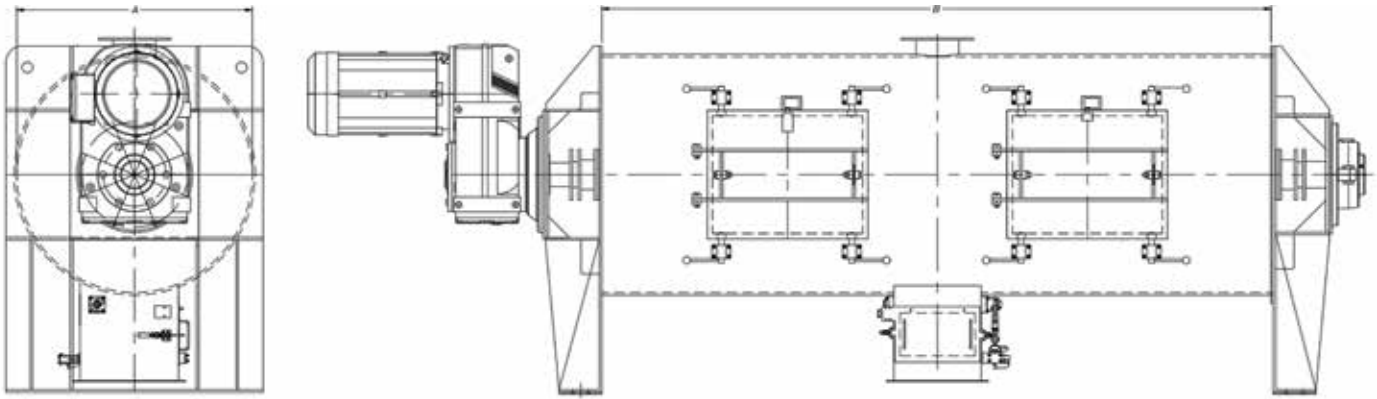
- Sterilizing contaminated spices and herbs to remove bacteria and mold
- Alkalizing "dutching" cocoa powder to increase darkness and remove bitterness
- Extracting pure vanilla extract from vanilla pods
- Sterilizing plant soil for mushroom production

Specifications

| Feature | Standard | Optional |
|---------------------------|---|---|
| Vessel | | |
| Configuration | Horizontal, cylindrical configuration | Tailor Engineered Design |
| Mixing operation | Fluidized paddle agitator | Plow, Heat transfer tool (fixed or removable) |
| Materials of construction | 304L SS | 316L SS, AR 200, Hastalloy, Inconel, Monel, 2205 alloy, Carbon steel |
| Working capacity | 3 ft ³ (85 liter) to 350 ft ³ (9,910 liter) | Up to 1,200 ft ³ |
| Shaft sealing features | Braided Teflon packing gland w/ split housing | Mechanical and semi-mechanical seals |
| Finish | | |
| Interior finish | Mill finish, welds ground smooth | #4 polished (RA 24-40) #4A polished (RA 40-60) |
| Exterior finish | Mill finish, 2B Mill finish | Sand blasted, Glass bead blasted, Primed and painted |
| Vacuum/Pressure | | |
| Vacuum / Pressure (ASME) | Atmospheric | -14.7 psi to 250 psi (-1 bar to 18 bar) |
| Heating/Cooling | | |
| Operating temperature | -20°F (-29°C) to 350°F (177°C) | Up to 450°F (232°C) |
| Heat transfer | Dimple jacket | Shell on shell, Half-pipe, Electric heater bands, Heated or Cooled agitator shaft |
| Various Media | Direct: Liquid CO ₂ Indirect: Steam | Steam, gas, air Brine, water, oil, electric |
| Options | | |
| Choppers | None | Chopper heads - X-mas tree style, Tulip style, others |
| Coatings/Linings | None | Plastic (Halar, Kynar®), Rubber, Tungsten carbide |
| Controls | None | State-of-the-Art controls, Tailor engineered per application requirements |
| Certifications | ASME Certified vessels and jackets | Sanitary options including USDA and FDA available |



Dimensions and Drawings



11/19 Printed in the USA. Subject to changes

| SIZE | TANK DIA. INCHES (A) | TANK LENGTH INCHES (B) | WORKING CAPACITY ft ³ * | WORKING CAPACITY LITERS | WORKING CAPACITY GALLONS | TOTAL ft ³ | ACCESS DOORS | CHOPPERS |
|----------------|----------------------|------------------------|------------------------------------|-------------------------|--------------------------|-----------------------|--------------|----------|
| CDB-3 | 20 | 32 | 4 | 108 | 28 | 6 | 1 | 1 |
| CLX-6 | 19 | 60 | 6 | 181 | 48 | 10 | 1 | 1 |
| CLX-12 | 24 | 72 | 12 | 345 | 91 | 19 | 1 | 1 |
| CLX-18 | 27 | 84 | 18 | 513 | 135 | 28 | 2 | 2 |
| CLX-30 | 33 | 96 | 31 | 875 | 231 | 48 | 2 | 2 |
| CLX-45 | 38 | 108 | 46 | 1,305 | 345 | 71 | 2 | 4 |
| CLX-60 | 42 | 120 | 63 | 1,770 | 468 | 96 | 3 | 4 |
| CLX-90 | 46 | 144 | 90 | 2,549 | 673 | 138 | 3 | 4 |
| CLX-135 | 54 | 162 | 140 | 3,950 | 1,044 | 215 | 3 | 4 |
| CLX-175 | 58 | 180 | 179 | 5,063 | 1,338 | 275 | 3 | 4 |
| CLX-350 | 72 | 234 | 358 | 10,143 | 2,680 | 551 | 4 | 6 |

*Working capacity based on 65% of total capacity.

| | |
|-------------|---|
| KEY: | X Denotes Agitator Configuration |
| CLF: | Cylindrical Long Fluidizing Paddle |
| CLP: | Cylindrical Long Plow |
| CLH: | Cylindrical Long Heat Transfer Tool |



Fluidizing Paddle Agitator



Plow Agitator



Heat Transfer Tool



EIRICH MACHINES
AMERICAN PROCESS SYSTEMS

Ask about other equipment in the American Process Systems® product line:



*OptimaBlend®
Fluidizing Blender*



Ribbon Blenders



Product Conditioners



*OptimaBlend™
Fluidized Zone Mixer*

EIRICH Machines, Inc.

4033 Ryan Rd. • Gurnee, IL 60031

P: 847-336-2444 • F: 847-336-0914

Email: eirich@eirichusa.com

Web: www.eirichusa.com