



# **PHLAUER**<sup>TM</sup><sub>AJSP</sub>

## Premium Modular Mixers

### DRYERS, VACUUM & ATMOSPHERIC COATERS



*Single Rotor Mixer\**



*Double Rotor Mixer\**



*Convection Dryer\**



*Vacuum Coater\**

**Good People To Mix With!**

**A & J MIXING INTERNATIONAL INC.**

**1-905-827-7288 US/CAN 800-668-3470**



## PRESIDENT'S MESSAGE

**A** & J Mixing International Inc. is a small company offering innovative and high technology in mixing and related fields that are cost effective.

Our in-house people specialize in conceptualization, mechanical detail, weighing, and project management. Vacuum, drying, heat transfer, pressure vessels, and PLC or computer controls are offered by networking with other companies who specialize in those fields. This approach allows A & J to have the best people without high overhead and still offer one source responsibility and service all over the world.

Customizing and delivering details is our forte. We will provide anything we can make work.

Our mission is to provide good equipment that is efficient and will perform for our customers, provide a return to our investors and stable careers for our employees.

A.B. (Bliss) Flower  
President

## FAST, ACCURATE MIXING

The AJSP unique paddle rotor (patented and patents pending) is specifically designed to make modular mixers with single, double or multiple rotors that mix from 10 to 60 seconds to an accuracy of .5% standard deviation or less. Batch sizes are 2 to 400 cu. ft. (10 to 11300 liters) The time varies with the number of rotors and the natural forces of segregation contained in the ingredients. The importance of mixing fast is to overcome the segregation forces, the main one being particle size differential.

The rotor is a low intensity dynamic continuum that is mechanically creating voids and then directing particles to fill the voids randomly which creates the mixing. The speed of mixing is from the volume of voids created, approximately one batch size per revolution at the median mixer size. The accuracy comes from the speed, that all particles are in motion with no dead spots, and controlling the size of the void such that large particles as a function of their diameter cannot occupy the space before the small ones get there.

## SINGLE & MULTIPLE ROTORS

Single rotor mixers are a better investment where shear is not important, or we are adding shear (there is more shear per unit of volume), and little or no liquid addition. For example, we have machines in powdered paints, colored grouts and masonry cement, vitamins and minerals, and have tested successfully on milk replacer and joint compound.

Double rotor mixers are faster, no shear unless added, a good pattern and high particle movement for adding liquids or convection drying. For example, we have machines coating pellets and particles both atmospherically and under vacuum, and coating a mineral with chemical and drying it.

Multiple rotors have been designed for a multiple function continuous machine, and could be used for machines over 400 cu. ft.

## DISCHARGES

Discharges are air operated single or dual port or drop bottom, flush mounted with no dead spots. We can address segregation on discharge whether caused by fluidization or rolling apart. Hydraulic and roll-over discharging are available.



Top: Double Port Discharge, above: Double Drop Bottom Discharge.

## BENEFITS

Improved product quality from accurate distribution or no degradation with dependable repeat performance is the major benefit. There can also be an economic benefit from downsizing and using our speed to get the production volume.

Fast, accurate mixing with a low intensity single rotor, we believe is unique which allows products previously made with double rotor or high intensity mixers to be made with both lower investment and lower operating costs.

A & J are world famous for quality and commitment, and delivering details. ♦

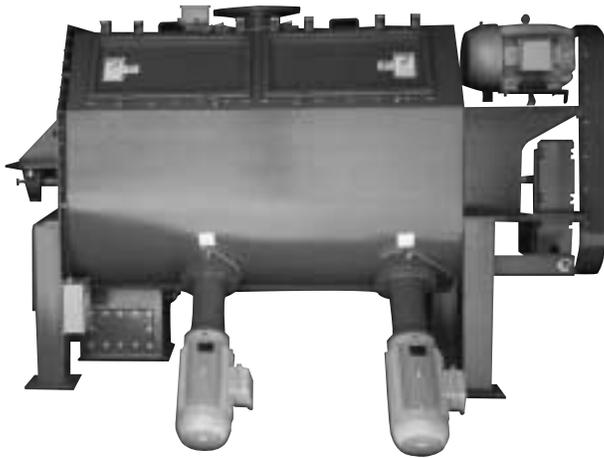
## MODULAR MIXERS

### SINGLE ROTOR

Mixing is a randomization process that has particles changing place, and can be changing properties such as size and moisture content.

The modular concept is a design specifically invented to offer premium performance in a configuration offering the best characteristics to do a job, and at the lowest investment.

A module is a housing enclosing a unique rotor\* that by itself is a mixer. Modules are added to enhance the ability to perform different tasks.



Single Rotor Port Discharge with 2 Shearmakers

The AJSP rotor divides the housing into zones each served by at least two paddles. All particles are moving so there is a dynamic interaction between zones. Voids are created mechanically and particles are directed to randomly fill the voids. The speed of mixing is achieved by the high volume of voids created. Accuracy is achieved by limiting the size of the void so particles do not roll apart. Single modules are usually better for watts per cube heat transfer or shear per cube from our SHEARMAKERS.

\*Patented and patents pending

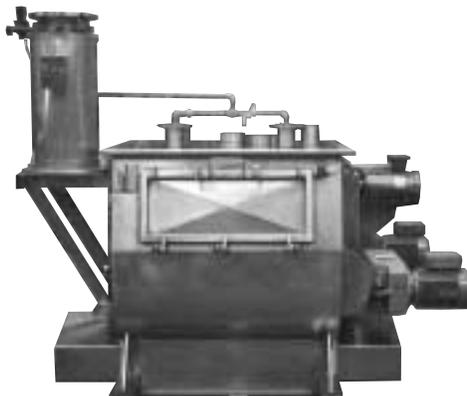


Single rotor mixer with 8 Shearmakers

### DOUBLE ROTORS

Double modules usually offer faster mixing, no shear, and a better pattern for adding liquid without agglomeration.

Multiple modules can be used to mix higher volume or perform different tasks in series. Typical mix times are 10 to 60 seconds to a standard deviation of .5% or less, or a coefficient of variation of 5 or less.



*This machine coats ambient temperature dextrose with hot melted fat before it can set up. This figure is typical of many systems we supply on load cells with controls to weigh the dry ingredients and the liquid, pressurize the liquid tank and spray the liquid on.*

## APPLICATIONS & INSTALLATIONS

**FOOD** – Cereals, vitamins & minerals, nuts, dextrose with melted fat, coffee beans, ground coffee, spices, flour mixes, dried soups, snack foods.

**CHEMICALS** – Plating chemicals, powder coatings, detergent, pharmaceutical, pesticides & herbicides, compounding polyethylene & polypropylene.

**ANIMAL FEEDS** – General mill mixer, textured feeds with fat, molasses, & digest; vitamins & minerals, fat coating fish & pet feeds, coating with enzymes, milk replacer, eel feed.

**BUILDING MATERIALS** – colored masonry cement, portland cement with fly ash and slag, joint compound, thermosetting lining paint, colored grouts.

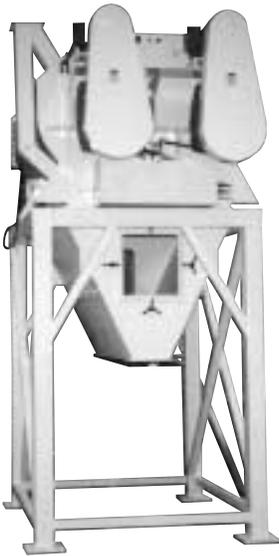
**MISCELLANEOUS** – zinc dust, mill scale, seed coating, bentonite, carpet freshener. ♦

### AJSP MIXERS CAN BE SUPPLIED FOR FOLLOWING:

- Dry randomization, low shear, low heat, removing lumps, color development.
- Abrasion resistance, non-stick coatings, coatings to resist chemical attack.
- Adding liquids with or without agglomerations.
- Drying, heating, cooling, vacuum, aqueous reaction.
- Preventing segregation on discharge. ♦

## DOUBLE ROTORS (CONT'D)

The balanced rotor in the AJSP makes for smooth mixing action where no consideration must be made for dynamic loading. Scale controllers using a high number of counts overcome the effect of a heavy tare weight. This combination makes weighing in our mixer the most frequently used method of measuring major ingredients. A & J has technics to reduce free fall that makes weighing of



Stack-up of Double Mixer



Double Mixer

some minors also practical. A & J has a technic for accurate and easy placement of load cells.

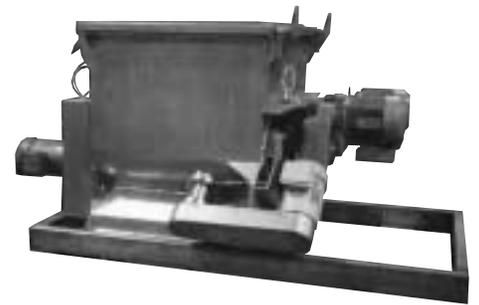
Most of our mixers are supplied with legs, end or side brackets drilled for load cells. The above mixer will be mounted on load cells on the floor. Two or three powders will be weighed directly into the mixer, and liquid will be measured with a flow meter. This mixer was customized to give more mixing capacity in an existing space. The hopper (*not shown*) is supported from another structure and connected with a flexible connector.

When there is a separate weighing system, the brackets are used to support

the mixer as shown at the far left, and the hopper for a drop bottom machine is bolted directly to the mixer. The hopper access doors are necessary to service the mixer discharge. This mixer is used to upgrade the capacity of a feed mill using our fast mixing times. Molasses, fat, and digest are entered through distribution pipes. ♦

## TEST MIXERS

Mixers for conducting tests on your products are available. Tests may be conducted at your plant or our manufacturing facility. Our test fleet includes mixers with liquid addition apparatus and Shearmakers. ♦



Test Mixer

## SUMMARY OF STANDARDS & OPTIONS:

The following is a summary. For complete details, please contact our office. Dimension sketches will be supplied. We reserve the right to change any specifications.

1. Mixers are designed to start under load and discharge while operating.
2. Capacities are nominally based upon 75% of the rotor volume.
3. Types of construction: Carbon steel, abrasion resisting, stainless chemical machines have bolted end with solid rotor shafts. Sanitary machines will have all welded housing with rotor installed with stub shafts.
4. Materials of construction: *All stainless*: welds ground and polished inside and out to 120 grit or as specified. *Contact parts only in stainless*: welds ground, polished inside; outside has carbon reinforcement and guards, all primed and painted. *Carbon steel*: inside as rolled, welds ground, sandblasted and oiled; outside primed and painted. *Abrasion resisting*: heat treated 425 min. Brinell plate. Finishes same as carbon steel.
5. Additional finishes: Non-stick coatings and coatings to resist chemical attack.
6. Discharges: Drop bottom, air or hydraulic operated. Port discharge either single or dual, air operated. The preceding are completely flush inside with no mixing dead spots. Discharge position is indicated by proximity switches. Options on port discharges: iris or slide gate valves with a dead spot.
7. Bearings and shaft seals: Pillow blocks with air purged, packing gland, or lip seals.
8. Drives: Standard are all helical shaft mounted. For high heat applications, inline helical with chain. Power options 230/460/360, 575/3/60, 380/3/50, 415/3/50. Motor types: TEFC, TEFC wash down, explosion proof for powders, explosion proof for gases.
9. Top configuration will include loading ports or doors as required for the job.
10. Cleaning assists: Side doors, gussets in the ends, drains, vibrators.
11. Motor controls are normally not included but are available.
12. Air piping is included and devices will be wired to a junction box.
13. Support - legs, or support brackets on the side or end and drilled for load cells.
14. Liquid addition - extra height, distribution pipes, spray pipes, high particle flow bar.
15. Shearmakers for high or low shear. ♦

## PHLAUER™ MODULAR MIXERS LIQUID ADDITIONS TO DRY PARTICLES

PHLAUER™ Modular Mixers are ideal for liquid additions. In most cases a double rotor mixer is used so liquid can be added in the zone between rotors without coating metal parts. The randomized high particle movement exposes all the particles at the top every few seconds giving accurate distribution.

Agglomerations can be prevented or broken. Prevention attacks the cause. A definition of an agglomerate in this context is one or more particles attached to each other by a liquid bridge that is stronger than the weight of the particles and all other forces in the mixer. The solutions are: slow down the spray; speed up the particles; add shear to break them.

Five methods are used to add liquids, and any combination can be added to a machine:

### SLUG LOADING:

With heavy particles and light liquid, it is possible to slug load the liquid and have it wipe from particle to particle. We slug load using a PHLAUER-TECH Distribution Pipe with milled slots. Liquids with particles can be used without clogging. Examples: lubricants on iron powder, fat or oil on animal feed pellets. These are fast operations with 1 minute cycles possible. Slug loading can cause “salt and pepper” effect at low levels of liquids, and on light particles can cause agglomeration.

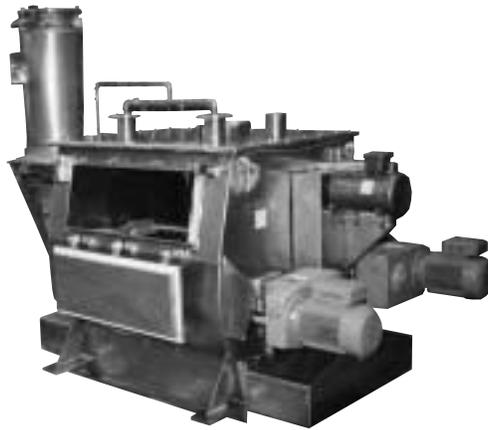
### SPRAYING:

This attacks the bridge that forms agglomerates, and eliminates “salt and pepper” effect. Flat fan sprays are recommended. The speed that you can spray is relative to weight of particle and absorbency. Nearly all products can be made by adjusting the spray. You must consider air movement and atomization is not recommended. Most of our jobs are done with hydraulic nozzles at 40 psi

(3 bar). The time has to be determined empirically, usually 1 to 2 minutes.

### HIGH PARTICLE FLOW BAR (HPFB)

The HPFB is a rotating spike bar upstream of the spray to create a flow of particles 3 to 5 times faster than the mixer rotor, which allows faster spraying without causing agglomerates. It is very effective for powders; for example hot melted fat on dextrose at 3% per minute. This bar will not break lumps--its purpose is to prevent them.



High Particle Flow Bar

### MIXING TIPS

- ✓ 1. For mixing of dry particles, put in all the ingredients and start the mixer.
- ✓ 2. When mixing dry particles and adding liquid, mix 15 to 30 seconds before starting the liquid.
- ✓ 3. For coating of one item, start the mixer 1 second before starting the liquid.
- ✓ 4. Mixing is randomization. When evaluating a mixer, look at the space for particles to change place.

## PHLAUER-TECH™ SHEARMAKERS

High speed cutters can be used to break up agglomerates formed by spraying or lumps in the ingredients. The Shearmaker consists of a motor direct coupled to a shaft entering through the side of the mixer. There will be a cutter inside the mixer, usually turning at a tip speed of 50-100 feet per second, depending upon the level of shear necessary to break lumps.



Shearmaker

### VACUUM:

When the amount of liquid to be added exceeds the amount normally absorbed, using vacuum could be the solution.

Particles and agglomerates have a capillary structure. This structure can be filled with air, moisture, or both. A very even coating of liquid has shown dramatic results in absorbency time. When you are working near the maximum absorbency, vacuum can be a good assist. It removes the air, and negates the effect of atmospheric humidity, and gives atmospheric pressure to drive the liquid inside. Additional pressure can be added. See page 7 for more details. ♦

## PHLAUER™ AJSP MIXER/COATER/DRYER

This package was customized for adding a chemical with water to a mineral and drying to 0% moisture.

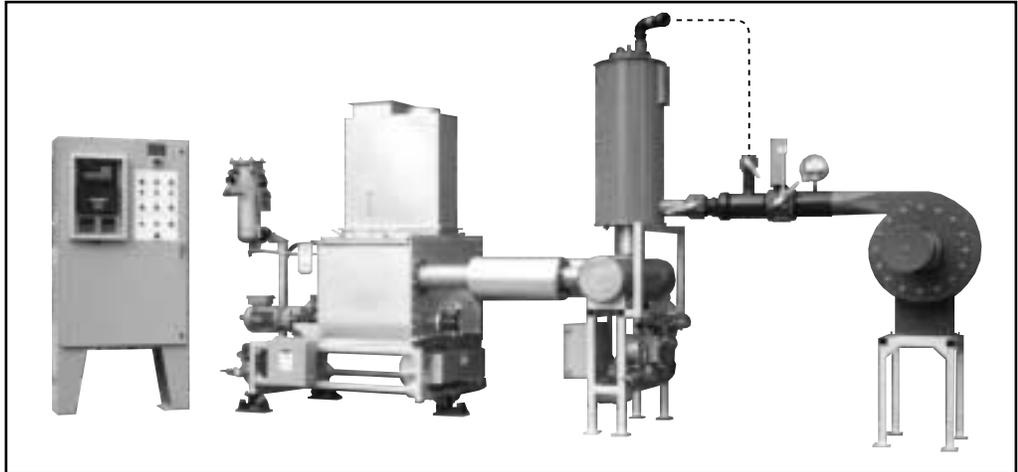
The package consists of an AJSP double rotor mixer (patented) on load cells to weigh the mineral, and pressure vessel on a separate load cell to weigh the water and chemical, a gas burner, blower, machine mounted sensors, and controls for the work module which included the feeders and take-away conveyor.

The package is complete, set up and shop tested before shipping using simulation. Field start-up and training are included.

The batch size of the machine shown is 8 cu. ft. (825 liters) and cycles easily 10 times per hour in this application.

The unique design of the piping connections (patent pending) allows the mixer to be used as a weigh vessel making this an economical processing solution, and was about half price of other mixer/dryers. Because of the accuracy of application, the chemical was reduced by 50% which in this case led to more saving from maintenance of downstream equipment.

By code the burner is started manually after the required purge. With the blower and burner low, the dry ingredient is entered by a valve with dribble feed



*Convection Dryer (Patented & Patent Pending)*

through the exhaust plenum. The liquids are then entered into the tank. The mixer is started, the liquid tank pressurized, and the liquids are sprayed on. After the liquid leaves the scale there is a short timer to clean the nozzles with air, and an over mix timer. After over mix time the blower is turned to high and when exhaust is sensed, the burner is turned to high. A timer and the exhaust temperature are monitored to know when the drying is complete.

Upon completion, the burner is turned low and then the blower. If there is space to discharge, the discharge door is opened and held until the scale is empty and then timed for material to clear. If cycle stop has not been pushed, the cycle repeats itself.

This system is customized to resist abrasion using heat treated plate in the mixer.

Our mixer/dryer design has all components selected for the temperature and uses flue effect plus heat slingers where appropriate to cool components.

This convection dryer is competitive with fluid bed dryers with similar efficiency. When a coating has to be added, it is more competitive. Many variations are available such as size, constant or variable heat, conduction. The competition call us “the renegade dryer company” because of our cost effective innovation. Call us for some fresh approaches. ♦

## REACTOR, CONDUCTION DRYER & COOLER

High particle movement and fast mixing makes the AJSP series ideal for heat transfer, reactions, drying and cooling. Conduction dryers are available direct fired or with jackets, and vacuum.

The machine shown at the right is used for aqueous reaction and customized with a flush ball valve. The jacket is designed to be heated with electrical heaters in glycol or other medium capable of 300 degrees F (150 degrees C.), or hot water. Cooling is

chilled water. A SHEARMAKER is included to remove lumps and get completely dried free flowing particles.

All units are custom designed for the specific purpose and may include weighing of ingredients and controls. ♦



*Reactor/Conduction Dryer & Cooler*

## PHLAUER-TECH™ CONTROLS

Our controls systems are user friendly, flexible, reliable, proven, and cost effective for mixers and dryers. They feature weighing of dry and liquid ingredients with recipe storage, named set points, automatic batching, ingredient usage accumulation and automatic free fall compensation.

The system has a PLC interfacing to a scale controller by digital inputs, digital outputs and relays. Set up and fine tuning of the process is through screens. Screens are also used to select formulation items and watchdog timer settings that monitor all events affecting production.

The auto cycle will start where it left off after acknowledging the alarm and pressing of cycle start after normal operational stops, such as short of an



ingredient. A manual mode is provided to complete cycles after a power interruption, experimentation, and maintenance. A modem is included for

off-site service.

The system is easily customized to your exact needs even after installation.

PHLAUER-TECH controls are part of every vacuum or dryer system. Based upon an approved Functional Description, appropriate devices are selected and a program is written. The equipment is set up at the shop and debugged using simulation. We come to the field with an operating program so start-up time is short. Our people stay a few days for training and last minute changes. Start-up is included and is provide along with service all over the world. ♦

*This photo shows the basic control panel for a mixer/coater/dryer. All instructions are entered through the MMI, scale controller, or UDC's. Systems can be upgraded to include computer based operator interfaces and touch screens.*

## PHLAUER™ AJSP VACUUM COATER

This package is specifically developed for adding herring oil, tallow, or powders to pellets with and without vacuum.

The package consists of our AJSP patented rotors working in a vessel designed for 15 psi (1.2 bar) external pressure on load cells to weigh pellets; oil tank(s) on load cells to weigh liquid; a vacuum pump, accumulator, all necessary valves and piping; machine mounted controls and a PLC control system for the work module including feeders, pumps, etc.

The package is complete, set up and shop tested before shipping. Field start-up and training is included.

Present sizes are 500, 1000, and 2000 liter batch. Practical working limit is 27" mercury or 920 milibars at sea level.

Using a batch mixer for coating has the advantages that arise from the high randomized movement that coats all the surface including the ends of pellets. This does two things: gets more oil on, and reduces water absorption that can make the feed sink faster. The mixer/coater has to be consistent in its ability to draw vacuum, or

meeting quality requirements is impossible.

Our vacuum specialist and pressure vessel specialist made our concept with patented AJSP rotors into the reliable design we have today, proven with installations.

Our concept reduced investment by using the mixer and a liquid pressure vessel on load cells to do the measurement, and a custom profile to limit the unused cavity so

we could use smaller vacuum pumps and reduce operating costs.

Contact us for dimensions and flow diagrams.

We are offering the only complete package, shop tested, and the lowest investment. ♦



*Vacuum Coater*

## PHLAUER™ PREMIUM AJSP MODELS & WORKING CAPACITIES SINGLE ROTOR MODELS

MODEL NUMBER	HORSEPOWER	CAPACITY (CU. FT.)	CAPACITY (LITERS)
LAB MIXER	1/3	1/3	10
182-4	2	3	85
202-6	3	4	115
243	3 & 5	7.1	200
243-6	5	8.5	250
304	7.5	15	425
365	10	26.5	750
366	15	32	906
426	20	45	1275
486-6	30	60	1700
488	40	75	2125
588	40	100	2835
688	50	150	4250
6810	60	200	5670

## DOUBLE ROTOR MODELS

MODEL NUMBER	HORSEPOWER	CAPACITY (CU. FT.)	CAPACITY (LITERS)
141-6D	3	2	60
182-4D	4	6	170
202-6D	6	8	225
243D	6	14.1	400
243-6D	10	17	500
304-6D	20	35	1000
365D	20	53	1500
366D	30	64	1815
426D	40	90	2550
486-6D	50	120	3400
488D	60	150	4250
558D	60	200	5670
688D	80	300	8500
6810D	100	400	11300



### Good People To Mix With!

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