TDS-MPRR-101-070824 R01

AM-MPRR Metal Powder Recovery & Reconditioning System

The **AM-MPRR** is jointly developed by VAC-U-MAX, Vorti-Siv and GEMCO, three American family-owned businesses with over 230 years of industrial powder handling experience. The system utilizes advanced vacuum technology to fully extract metal powders from the build box, sieves out foreign debris and oversized agglomerations, and reconditions the on-spec powder for future use.

The **AM-MPRR** system addresses key challenges faced by powder bed fusion and binder jet printing operations. It offers a comprehensive solution that translates to:

- **Reduced Waste:** By effectively recovering and reconditioning unused metal powder, AM-MPRR minimizes waste and maximizes material utilization.
- **Cost Savings:** Material usage optimization and streamlined operations lead to significant cost reductions in overall printing workflows.
- **Improved Efficiency:** The combined vacuum removal and sieving process significantly reduces downtime, resulting in faster printing cycles.
- **Enhanced Sustainability:** AM-MPRR promotes a more sustainable AM environment by minimizing waste and optimizing material usage.
- **Maintained Quality:** The system ensures reconditioned powders meet the high-performance standards required for critical AM applications.

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Reclaim:

- The AM-MPRR system utilizes an innovative vacuum conveyor developed by VAC-U-MAX specifically for metal powders, including reactive versions that must be handled in an inert atmosphere.
- This technology safely and efficiently removes unused metal powder from the build box, eliminating the need for manual handling and reducing the risk of operator exposure and/or explosion.
- After separating the powder from the airstream, the conveyor then directly deposits the recovered powder onto a sieve to remove oversized materials before conveying the powder once again into the tumble blender for further processing.

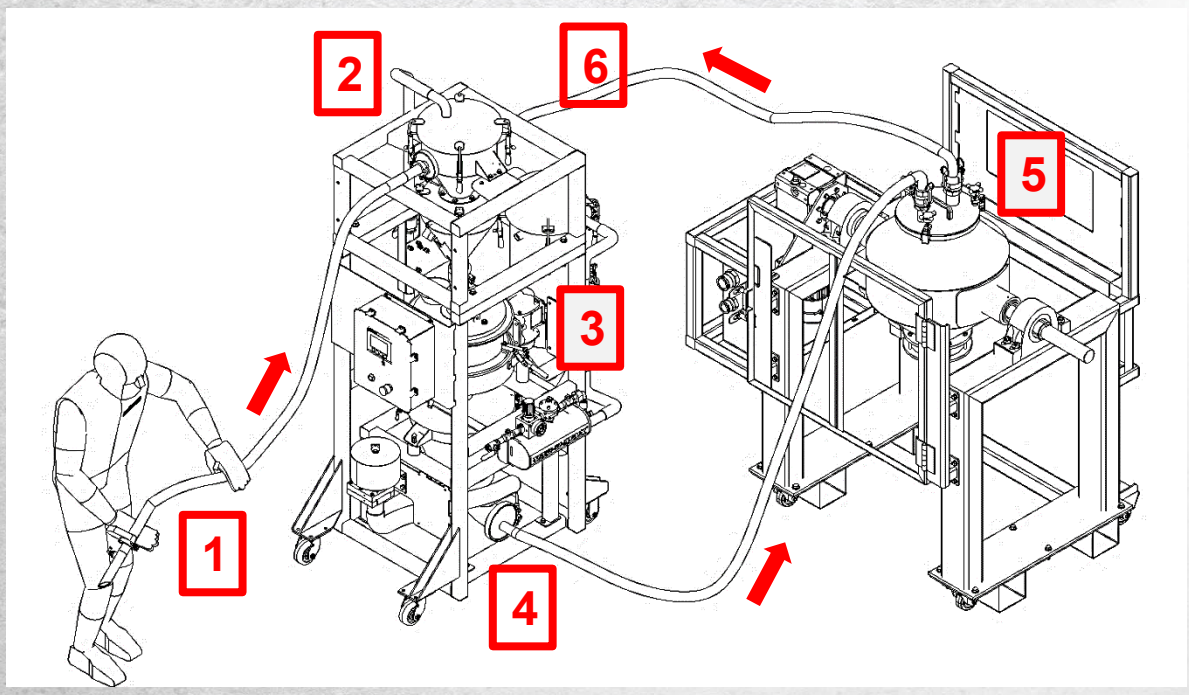
Reclassify:

- A key component of the AM-MPRR system is a vibratory sieve from VORTI-SIV.
- This sieve incorporates an ultrasonic anti-blinding device ensures continuous operation and removes oversized particles and contaminants from recovered powder.
- VORTI-SIV's sieving technology plays a crucial role in maintaining consistent reusable powder quality for successful printing through multiple cycles.
- Standard sieve is a single deck with 63-micron screen cloth, but other sieve sizes and side outlets are also available.

Recondition:

- The recovered and reclassified powder enters GEMCO's tumble blender, a renowned solution for powder homogenization in the AM industry. Residual identical powder from multiple printers can be delivered to the tumble blender to be homogenized into a consistent masterbatch for reuse. Another version of the MPRR not only blends the powder effectively but dries it to a single-digit moisture content to improve the powder flowability.
- Tumble blenders and dryers are the most efficient devices for metal powder reconditioning.
- Flowability can be increased by using heat and gas purging.
- Tests for flowability show the effectiveness of the process.

How Does It Work?



1-2: Operator vacuums powder from the build box which is collected in the Vacuum Receiver and is separated from the airstream by gravity. Carryover dust (if any) is collected in the small collection container on the opposite of the frame.

2-3-4: Vacuumed powder is discharged through a surge bin and metered onto the sieve deck. Oversized particles remain on top of the screen cloth or exit through an optional side outlet. Reusable powder exits the sieve through the center-bottom outlet and collects in a 2ft3 (57 liter) conical feedbin.

4-5: The bottom of the feedbin is equipped with a screw discharger to control the flow out of the feedbin to avoid flooding the vacuum hose to the Blender or Dryer. The operator turns two ball valves to redirect the suction from the vacuum receiver to the blender or dryer. Powder will begin to transfer from the feedbin to the blender/dryer until the feedbin is empty.

5-6: As the blender or dryer is loading, carryover dust (if any) is collected in the small collection container on the MPRS module. When loading is completed, the two vacuum hoses are disconnected from cover on the blender or dryer, and camlock caps are installed. Disconnected hoses must be reattached on the side panel. If the hoses are not attached on the side panel, the blender or dryer will not rotate.

Technical Features:

1) VAC-U-MAX Vacuum Conveyor

- Rated for 1500 lb (680kg) per hour throughput.
- Single venturi power unit: no moving parts, no electricity, no heat, no lubrication
- Operates on compressed air or inert compressed gas without modification
- Easily cleaned without tools, interior welds are continuous and ground smooth, interior surfaces are polished. Stainless steel product contact parts.
- Reusable primary filter, PTFE coated, static-conductive, rated 99.9% @ 1 micron,
- Secondary HEPA filter rated 99.97% @ 0.3 micron
- Provision to capture exhaust air with inert gas (when applicable)

2) Vorti-Siv Screener

- Standard 15” (380mm) round sieve with single electric vibrator motor
- Stainless steel screen cloth is 63 micron with ultrasonic anti-blinding system
- Other sieve sizes, screen materials and side outlets are available
- Rescreenable screen mesh – save money!
- Visual inspection port on sieve cover

3) GEMCO Tumble Blender or Dryer

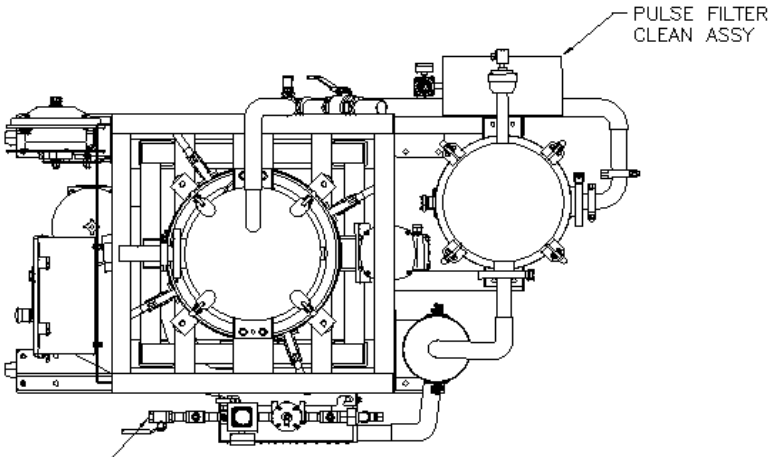
- Standard 2ft3 (57 liter) rated batch capacity
- Tumbling action is most efficient and effective method for blending metal powders.
- Blender version takes identical powders from multiple printers and delivers a new homogenous mix.
- Dryer version removes moisture that ruins powder flowability. Achieve single-digit moisture levels and renew your powder to “flow like water” again.
- TEFC Gearmotor with rotation speed range between 5-25 RPM.

4) General

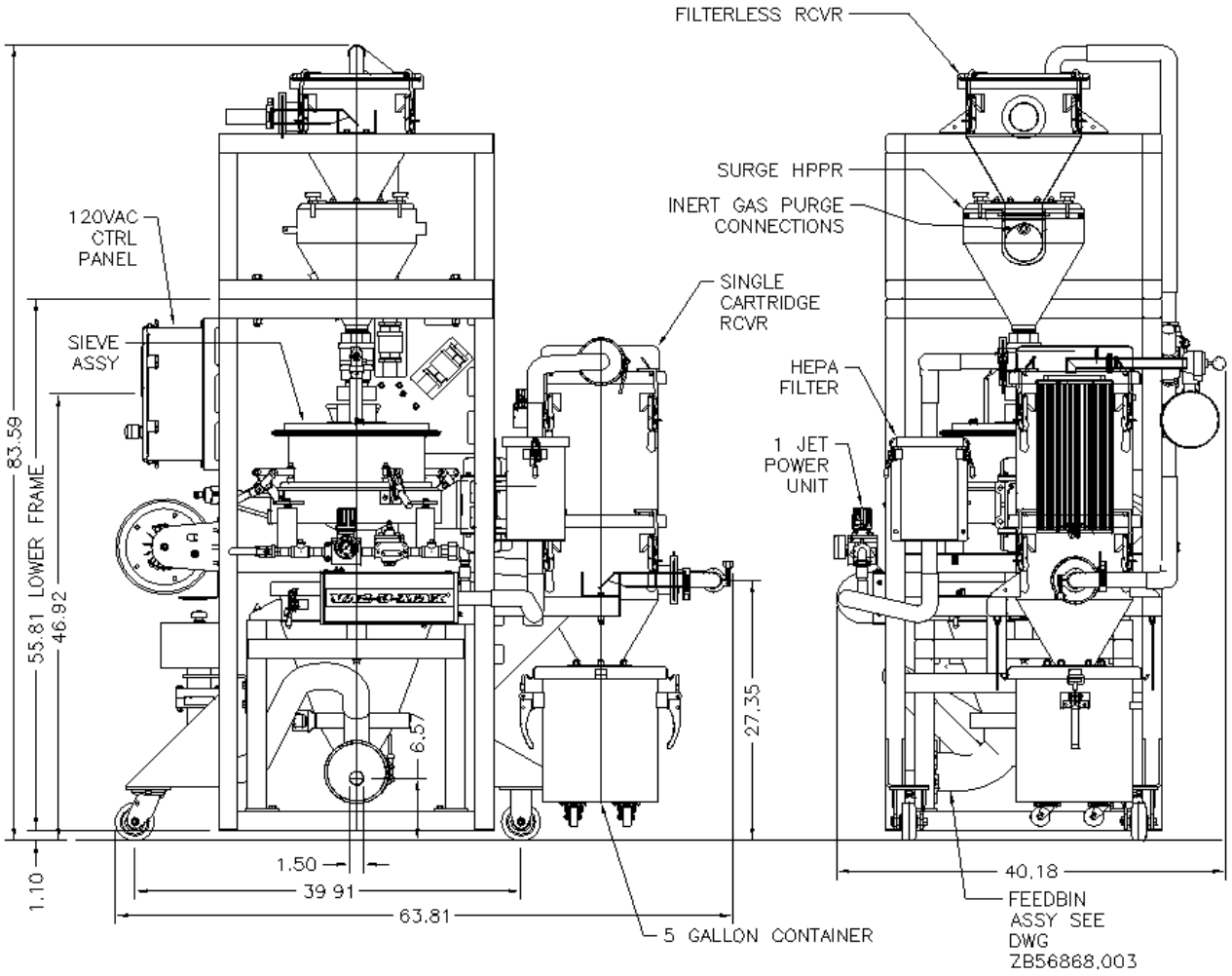
- Mobility: Vacuum conveyor and sieve are mounted on an easy-rolling square-tube frame, and blender / dryer is mounted on a separate heavy-duty frame with forklift pockets and heavy-duty casters. Easy set-up and transport in crowded printer rooms. Power and control cords are fitted with quick-disconnects
- Safety: Static ground circuit monitoring with interlock to prevent system operation if grounding circuit is not complete. Blender/Dryer is equipped with safety doors with controls interlock switch. Inert gas manifold with purge fittings across the entire AM-MPRR system for reactive metal powders. Stations for blender loading hoses with interlock ensure that hoses are disconnected before blender/dryer can rotate.

5) Controls:

- UL-certified NEMA 4 control panels. System panel is equipped with an HMI and PLC.



MPRS Module



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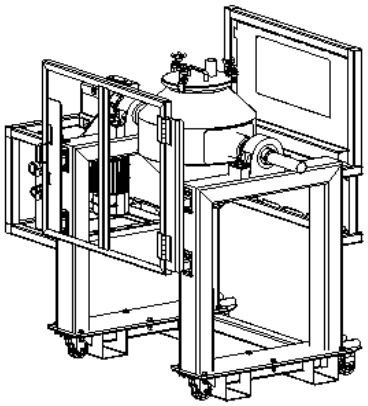
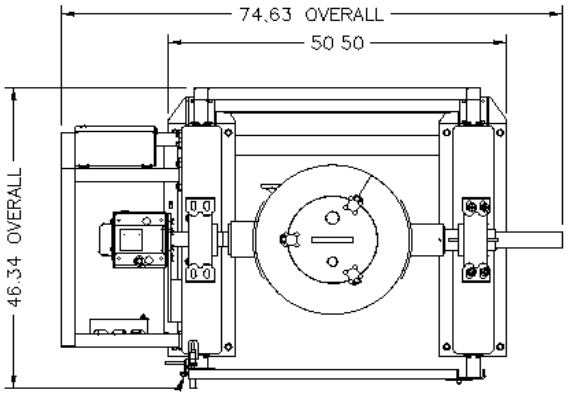
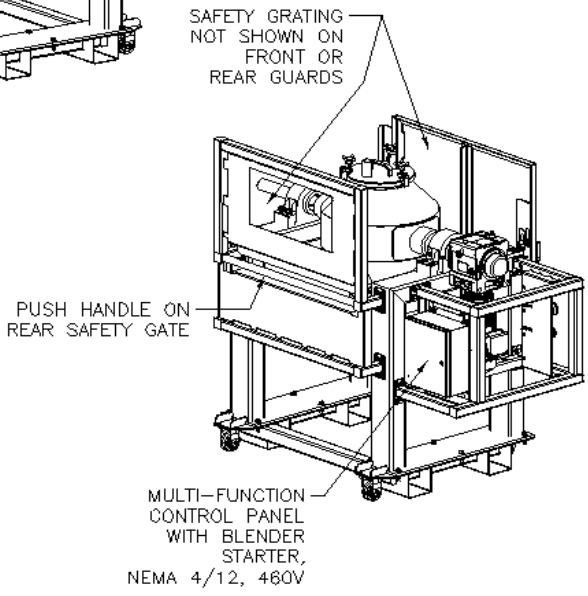
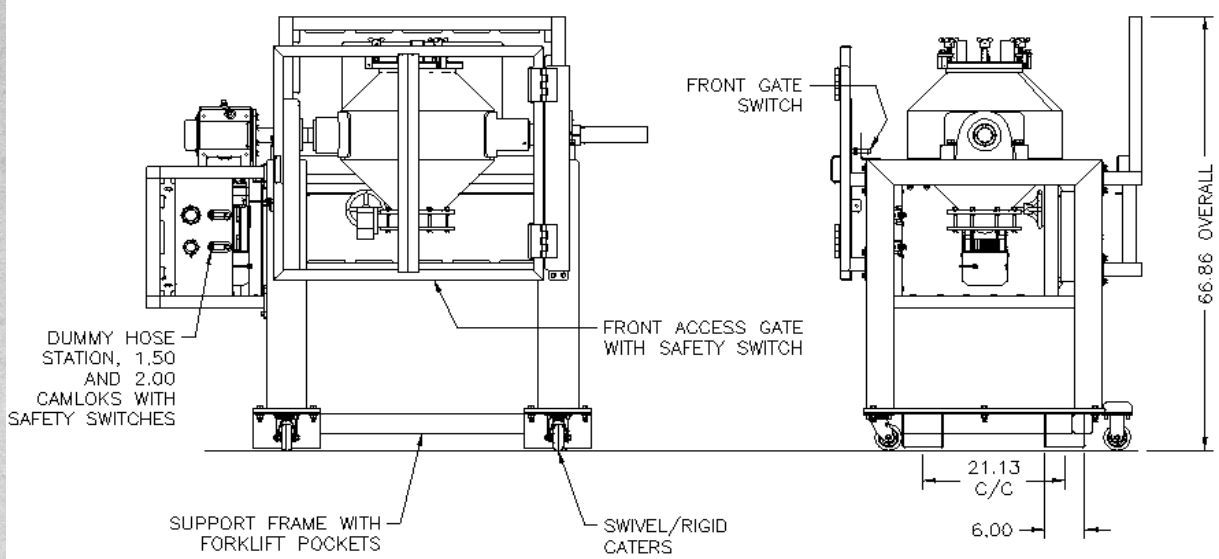
Dryer or Blender Module









Blender shown is 2ft3 (57 liters)

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Utilities:

- Single-point ½” compressed gas supply (air or inert gas such as argon) to MPRS module
- Single-point 3-phase power supply (240V, 380V (50hz), 460V or 600VAC) to dryer module
- Single-point 115VAC or 220VAC power supply to MPRS module. Spring-return cable reel with 30ft (9m) cord (without plug) is mounted on the MPRS module.

Commercial:

- The AM-MPRR is a collaboration of three companies. Quotations are generated by VAC-U-MAX and purchase orders are to be issued to:

VAC-U-MAX
69 William Street
Belleville, New Jersey, 07109 USA

Warranty and Service Support for the AM-MPRR:

- A single integrated O&M Manual will be supplied with the AM-MPRR system when purchased from VAC-U-MAX. The Manual will include all necessary operation and maintenance instructions, drawings, wiring diagrams and pneumatic schematics, and OEM parts lists.
- Customers should purchase replacement spares from either VAC-U-MAX, Vorti-Siv, or GEMCO, depending on where the part is used in the AM-MPRR System. Customers will automatically be set up with a customer account at each of the three companies when an AM-MPRR system is purchased.
- The warranty for the AM-MPRR system is two (2) years from start-up, excluding normal wear parts such as filters, screens and hoses. OEM components such as gearmotors are warranted by the respective manufacturer.