

Resodyn Acoustic Mixers Control Features

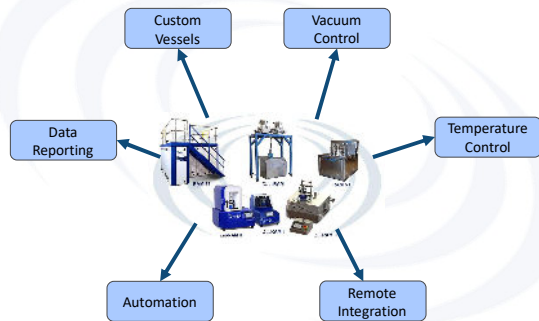
Justin Whaley
Engineering Manager
Resodyn Corporation



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Resodyn as a Service Provider



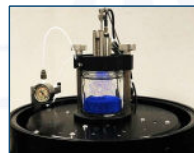
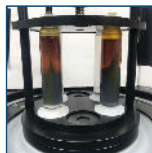
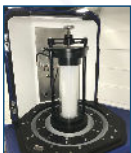
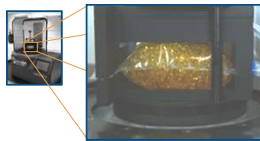
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Vessel Design and Monitoring

- Vessels can be designed to meet nearly any processing need
 - Additional temperature sensing
 - Non-Contact temperature sensing
 - Humidity & Leak monitoring
 - Individual Vacuum Sensors

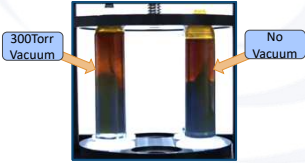


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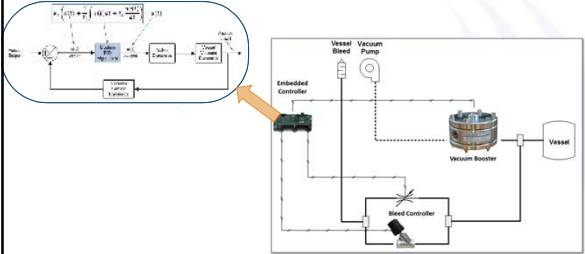
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Vacuum Control and Monitoring

- Provides Controlled Partial Vacuum to Vessel
- Vacuum Breaker Design



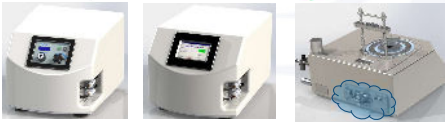
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LabRAM I and LabRAM II Vacuum Systems

	Manual	Automatic	LabRAMII-H
Built-in Pump	✓	✓	✗
Integrated into RAM	✗	✗	✓
Digital Vacuum Readout	✓	✓	✓
Calibrated to NIST Standard	✓	✓	✓
Active Controller	✗	✓	✓
Communicates with LabRAM	✗	✓	✓



Manual Vacuum Automatic Vacuum LabRAMII-H

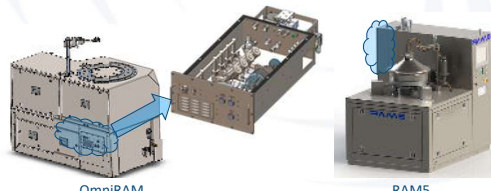
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OmniRAM and RAM5 Vacuum Systems

- Controls located in electrical cabinet with pneumatic valves and sensors located in auxiliary enclosure
- Works with dedicated vacuum pump or facility vacuum source



OmniRAM

RAM5



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Temperature & Flow Control

	Temp. Monitoring
Monitoring	Mix Temp.
Alarms	Mix Temp.
Control Method	None





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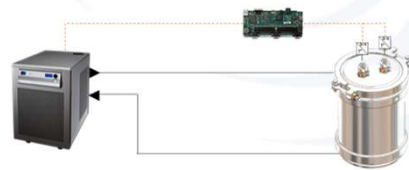


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Temperature & Flow Control

	Temp. Monitoring	Temp. Control
Monitoring	Mix Temp.	Mix Temp.
Alarms	Mix Temp.	Mix Temp. Limits & Deviation
Control Method	None	Cooling Fluid Temp





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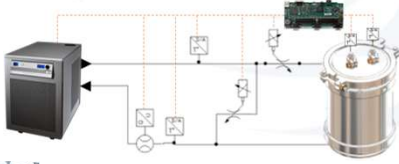


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Temperature & Flow Control

	Temp. Monitoring	Temp. Control	Flow Control
Monitoring	Mix Temp.	Mix Temp.	Mix Temp. & Heat Transfer
Alarms	Mix Temp.	Mix Temp. Limits & Deviation	
Control Method	None	Cooling Fluid Temp	Setpoint & Flow to achieve target Temperature



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Remote Control

- Remote operation provides operator protection
- Standard on all Hazardous units but available for all mixers
- Mixers can be integrated into client DCS



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Automated Vessel Loading

- Robotic vessel clamping has been incorporated on every machine family
- Resodyn's equipment can integrate with facility equipment



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Automated Vessel Loading

- RAM 5 Vessel Loading and Clamping



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Automated Vessel Loading

- RAM 5 Vessel Loading and Clamping



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Integration

- Continuous RAM Integration
 - Flow, pressure, and temperature sensors
 - Loss-in-weight powder feeders
 - Liquid pumps
 - Conveyance & Post-mix Operations
- Safety
 - Light Curtains
 - Safety Switches
 - Hazardous Location
- DCS Integration
- Custom Integration



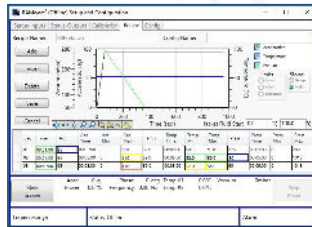
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Recipe Control

- Recipes Define Pre-Programmed Mixing Routines for repeatable mixing and usability during production
 - Time
 - Acceleration
 - Temperature
 - Vacuum
- User control of Alarm & Alarm Behavior!



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Data Acquisition and Batch Reporting

- All RAM Systems Record Parameters in Real Time
 - Resonator / Drive Parameters
 - Temperature / Vacuum Control Variables
 - Machine Health
- Parameters can be Plotted In Real-Time while running or from Historical Data when stopped
- RAM5 / OmniRAM Data options
 - Customized batch reports
 - Network integration
 - CFR 21 Part 11 Compliant
- What does this look like in practice?



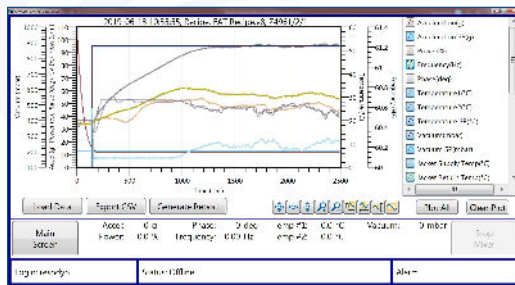
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Data Acquisition and Batch Reporting

What does this look like in practice?



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Summary

- **Standard Systems Have with a Rich Set of Features**
 - Recipe Control
 - Data Viewer & Exporting
 - Remote Control Options
- **Vacuum and Temperature Control are Popular Options that Improve Mixed Product Quality**
- **Capabilities to Develop and Deliver Custom Automation and Integration**



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**Thank you for your time
and attention.**



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