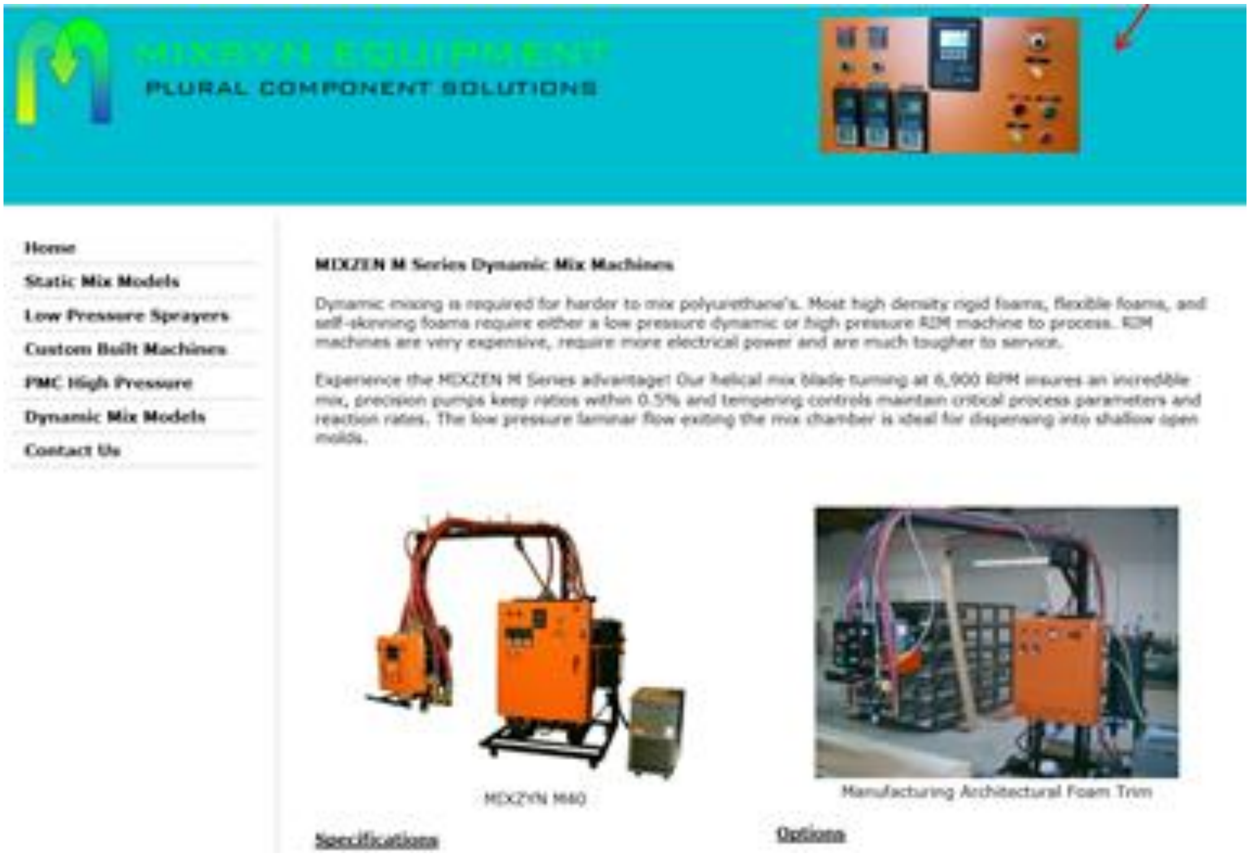
## The case for foam process monitoring

A member of one of the largest foam manufacturers commented to me when we were discussing industry developments that he believes the biggest threat to the industry is the fact that installers can process foam off ratio (meaning that the two chemicals involved are not mixed in the proper proportion).


I would expand that general processing problem to include processing foam at the wrong temperatures, which often creates off-ratio material. My recommendation to the industry is mandating the use of monitoring equipment that would eliminate this problem. I used this type of equipment in my business for twenty years, and it allowed me to work on high-need, high-profile projects like the Guggenheim Museum.

This type of QA monitoring equipment has been in use for many years by OEM foam molding companies throughout the industry.  The equipment is easily adaptable to on-site spray foam processing equipment, which is very simple compared to automatic high production RIM molding equipment.

# Standard OEM QA Equipment




Temperature sensors and controllers are inexpensive, easy to implement, and reliable, even at the remote gun location. Flow meters are more expensive, but more than pay for themselves by avoiding off-ratio events. Shut-off switches and/or valves are also inexpensive, easy to implement, and reliable. Eighty percent of the real (not perceived) foam problems I see are caused by equipment-related issues.

Restrictions in the hoses (upstream and down), improper daily machine setup, improper temperatures, and empty supply-side reservoirs cause most of the problems. Basic temperature and flow ratio monitors would detect out-of-spec processing parameters and immediately shut down the processing equipment, thus preventing poor quality material from being installed.

Difficulties can still arise if the operator over-rides the lock-out functions built into these systems. However, most processing problems can be still be avoided by requiring digital or paper reports generated by the monitors themselves in the submittals. This documentation would identify installers who do not use the QA equipment properly.

These reports would document out-of-spec. operations, allowing the specifier or consumer to identify improper processing quickly. This would discourage installers from over-riding the QA controls, and encourage proper maintenance. These monitoring systems have the computing power, data logging capabilities, and output interfaces necessary to generate reports for all of the processing parameters on a full-time basis.

Requiring this type of QA documentation will also serve to pre-qualify foam installers. A major qualifier to use when choosing an installer is does he possess the equipment capability of monitoring temperature and ratio. Those installers who do understand proper processing, or do not have the proper

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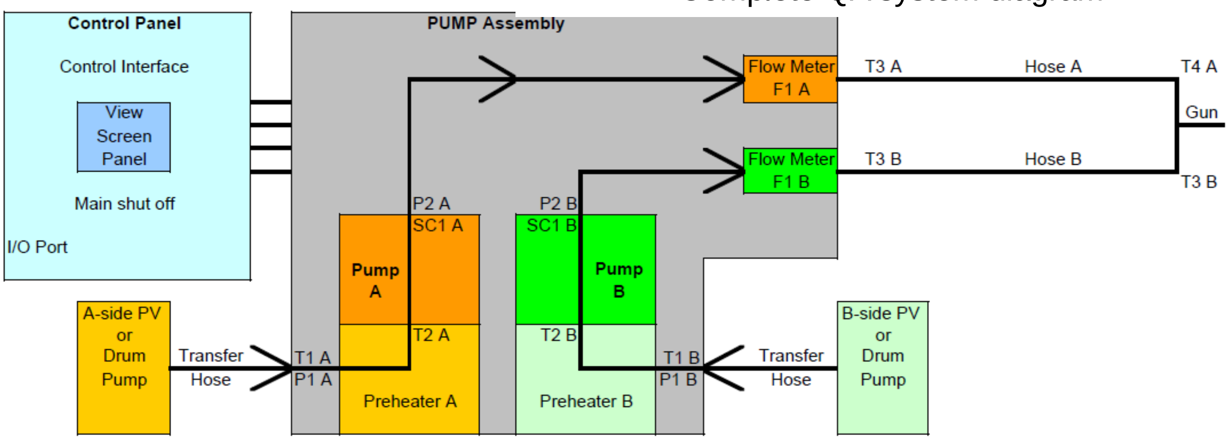
QA equipment, will not be able to meet the bid requirements included in solicitations that require confirmation of this type of QA control equipment and reporting in the bid submissions.

The following information about ratio monitoring shows what the equipment looks like, and everything an installer needs to assure he is meeting the requirements set forth in the SPFA Equipment Guidelines. Ideal QA equipment would operate as indicated in this diagram:

**Pump Monitoring System Diagram**

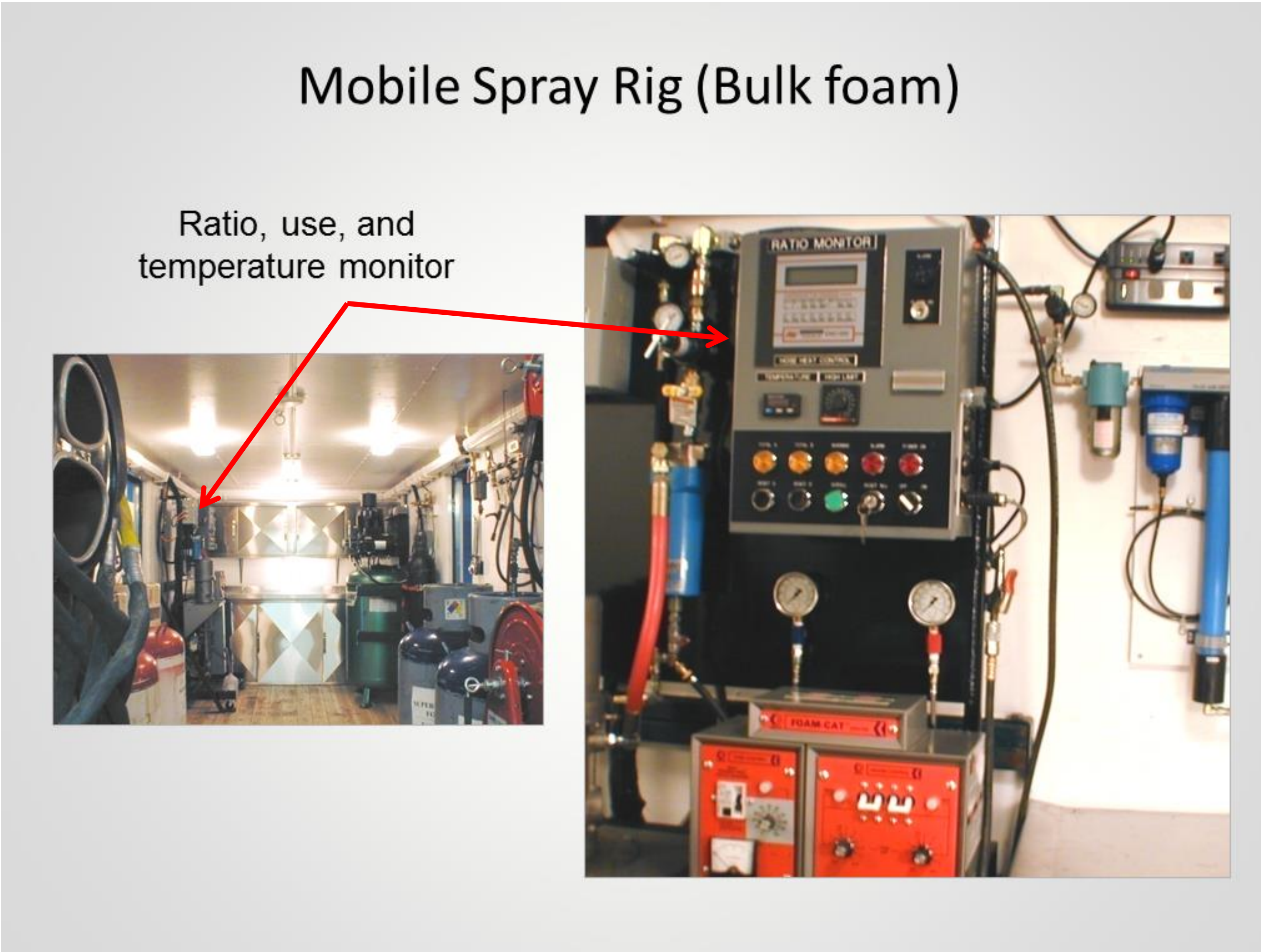
Complete QA system diagram




| | | | |
|---|---|---|---|
| T1 A | Temperature at inlet from transfer hoses (A) | 0 to 200 degrees F | Shut down if below set point |
| T1 B | Temperature at inlet from transfer hoses (B) | 0 to 200 degrees F | Shut down if below set point |
| T2 A | Temperature at oulet from preheater (A side) | 0 to 200 degrees F | Shut down if below set point |
| T2 B | Temperature at oulet from preheater (B side) | 0 to 200 degrees F | Shut down if below set point |
| T3 A | Temperature in first section of hose (A side) | 0 to 200 degrees F | Shut down if above high limit set point |
| T3 B | Temperature in first section of hose (B side) | 0 to 200 degrees F | Shut down if above high limit set point |
| T4 A | Temperature at gun end of hoses (A side) | 0 to 200 degrees F | Shut down if below set point |
| T4 B | Temperature at gun end of hoses (B side) | 0 to 200 degrees F | Shut down if below set point |
| P1 A | Pressure at outlet of Transfer hose (A side) | 0 to 500 psi | Shut down if below set point |
| P1 B | Pressure at outlet of Transfer hose (B side) | 0 to 500 psi | Shut down if below set point |
| P2 A | Pressure at outlet of pump (A side) | 0 to 3,000 psi | Shut down if below set point<br>Alarm, then shut down if A - B difference exceeds preset limits |
| P2 B | Pressure at outlet of pump (B side) | 0 to 3,000 psi | Shut down if below set point<br>Alarm, then shut down if A - B difference exceeds preset limits |
| F1 A | Flow rate (A side) | 0 to 5 GPM | Alarm, then shut down if A - B difference exceeds preset limits |
| F1 B | Flow rate (B side) | 0 to 5 GPM | Alarm, then shut down if A - B difference exceeds preset limits |
| SC1 A | Stroke counter (A side) | 0 to 100,000 | Record only |
| SC1 B | Stroke counter (B side) | 0 to 100,000 | Record only |
| PV A | Pressure vessel (A - Side) | | |
| PV B | Pressure vessel (B - Side) | | |

Graco manufactures more than 90% of the pump systems that are used for in-field foam processing. Graco makes ratio monitoring systems for manufacturing, but only offers pressure monitors for field applications.


**What a temperature and ratio monitor looks like installed in the rig:**

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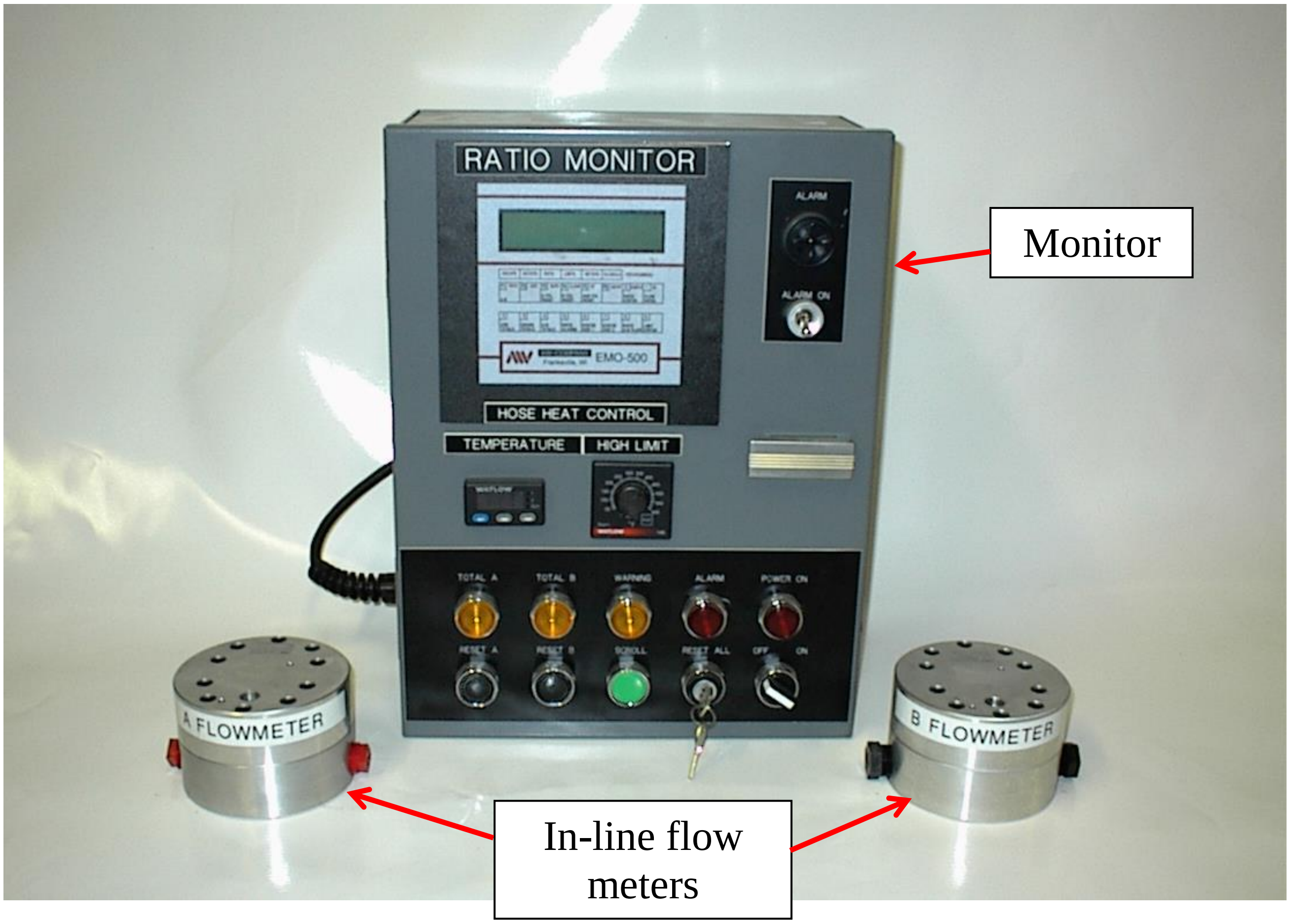
## Pieces – parts

These are the two main components of a temperature and ratio monitoring system.




Miscellaneous accessories needed for a complete monitoring system include the following:

1. Thermistors and wire to locate at the gun, in the hoses, and right after the primary heaters.
2. In line air valve to shut off pump if electrical lock-out is not easily available
3. Electrical outlet with surge/overload protector at monitor plug in
4. Remote alarm or warning light if used in addition to built-in alarm

The incentive for the industry to use monitors, in conjunction with other quality control methods, is to avoid problem foam installations. In the absence of ANSI standards, it is up to the industry to mandate this type of quality control equipment. Architects can specify this as a quality control method, and foam manufacturers, who suffer the most from poor quality installations, should mandate that monitors be used by everyone who buys their material. This would have to be a universal mandate. If only one or two manufacturers require the use of monitors it would effectively raise the price of their products in what is already a very competitive marketplace.

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