

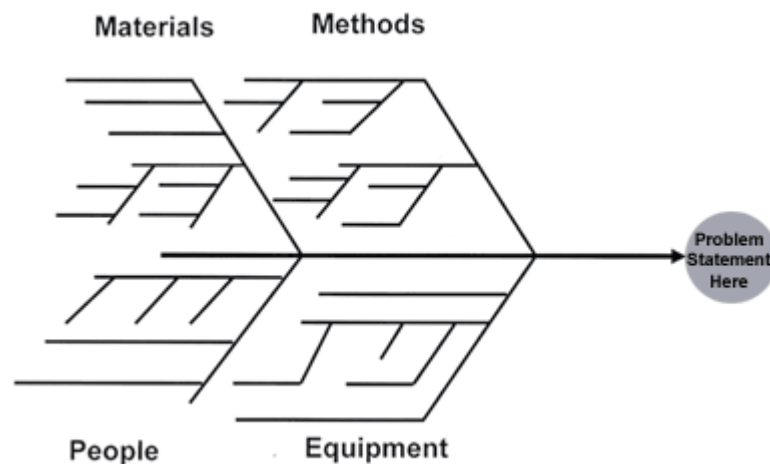
Troubleshooting mold release issues--the Fishbone approach

Operational problems that need troubleshooting occur in all types of manufacturing settings, whether the parts are made of polyurethane, composites, rubber or concrete. When problems occur what's needed is the ability to get to the root cause---quickly. The Fishbone approach to troubleshooting saves time by zeroing in on root cause(s) and avoids the time trap of getting distracted by the problem's symptoms rather than its cause(s). This problem solving tool was first introduced by Kaoru Ishikawa, one of Japan's Quality Gurus, who developed the technique in the early 1950s. In a manufacturing environment the four main categories of potential causes include Methods, Materials, Equipment and People. It is a rare problem, indeed, that can't be fixed with an adjustments to one or more of these variables.

Common Mold Release Problems

Troubleshooting issues might include surface defects, parts sticking to the mold or having molds with the excessive build-up which triggers additional cleaning and more downtime. For faster problem solving, having a consistent approach is key. The Fishbone approach or Ishikawa diagram, as it is often known, is a tool Huron Technologies uses when working with clients in problem solving to determine root causes. This is an important tool because it saves time thus reducing waste and improving productivity. These are the three ways it contributes:

1. The diagram helps the manufacturing team focus on identifying, exploring and graphically depicting all the possible causes.
2. The Fishbone tool to helps the team keep focused on causes. The tool is not centered on the history of the problem, the symptoms of the problem or the personal concerns of individual team members.
3. Using the Fishbone builds consensus to develop support for the solutions. This happens through summarizing the collective knowledge of the problem. Support includes buy in from management, engineering and manufacturing operations including line workers.



Using the Fishbone Tool

The fishbone includes four primary "bones," Materials, Equipment, Methods and People extending from the spine of the diagram. When troubleshooting, you gather your team and briefly state the problem--without presuming the cause. The problem statement is written at the "head" of the diagram. Next, work through each of the four distinct areas. As you investigate the problem's cause, ask the detailed questions from each area of the diagram, probing to determine the root issue. *Repetitively asking the question "Why," each time you pull back a layer of the symptoms can also assist in determining the root cause. The first level reason for a problem triggers another why question which then triggers yet another. This technique is called "5 Whys." Five is not always the precise number, but rather is a good rule of thumb.* Answers to these why questions are noted. Smaller, additional branches may be added as the root cause analysis goes deeper

In examining the "Equipment" component of the diagram, the following manufacturing parameters are covered:

- line configuration, speed and dry time
- dispensing equipment and how it is currently functioning
- air line examination- humidity of the air, pressure settings and ventilation performance
- spray - equipment including orifice size, tip clogging and the mesh size used for in line filters
- dilution equipment and particularly the cleanliness of its opening
- mold cleanliness, configuration and operating temperatures

The "People" area of the fishbone includes these manufacturing parameters:

- Molded polymer environmental conditions
- Molded polymer mixing of materials
- Release agent materials
- Release agent mixing processes
- Release agent quality

For the "Methods" component of the diagram, the following manufacturing parameters are included:

- Dispensing polymer
- Dispensing polymer pour pattern
- Dilution process
- Demold process
- Application training
- Frequency-over application
- Frequency-under application

The "Materials" component of the diagram covers these parameters:

- Molded polymer environmental conditions
- Molded polymer mixing of materials
- Release agent materials
- Release agent mixing processes Release agent quality

After the answers to questions for all four areas have been noted, the preliminary information is there to evaluate. Using this information, you can rank the possible causes warranting further investigation. Focusing on identifying the true root cause means testing, data collection and observation to eliminate false causes. When the true root cause is identified you move directly into planning and implementing solutions.

Experienced process engineers, supervisors and plant managers develop their troubleshooting abilities over time. They often operate intuitively and don't always use a formal root cause methodology for troubleshooting. However, when working with newer staff members, different types of product, new materials or changes in the manufacturing processes, the fishbone tool saves time. Taking this comprehensive approach to problem solving prevents one from jumping too quickly to a false solution before the real cause is identified. The goal is to **ready, aim, and fire** through to an effective solution

rather than using the **ready, fire, aim** approach, too often triggered when production problems arise. The quick solution is not always the correct one.

Troubleshooting in the Real World

In a recent troubleshooting situation, heavy build up on the molds was reported while producing thermoset plastic parts. The plant manager's first thought was "mold release problems." However, the fishbone approach revealed an inverted spray gun filter, mesh on the spray lines that was too fine and over application of the release caused by setting the air pressure too high. Addressing these issues, identified in one problem solving visit, meant resolved the problem. Changing the mold release was not required. Making the time and committing the resources for a test cycle with a new release agent was not required. Using the fishbone technique helped zero in on the actual root causes more and deliver an effective solution quickly.

Assistance with Troubleshooting

Huron Technologies, Inc. performs regular troubleshooting for its clients and prospects. Our chemical engineers and application chemists work with the client's manufacturing staff using the Fishbone methodology to resolve current problems. This type of support also provides a tool staffers can use in troubleshooting future issues. Separate fishbone diagrams are also available for specific types of problems--Voids appearing on parts, and Non-uniform surface quality. Fishbone diagrams including Huron Technologies experiences with all of the key areas - Materials, equipment, methods and people are available by calling **1-800-275-4902**.

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