

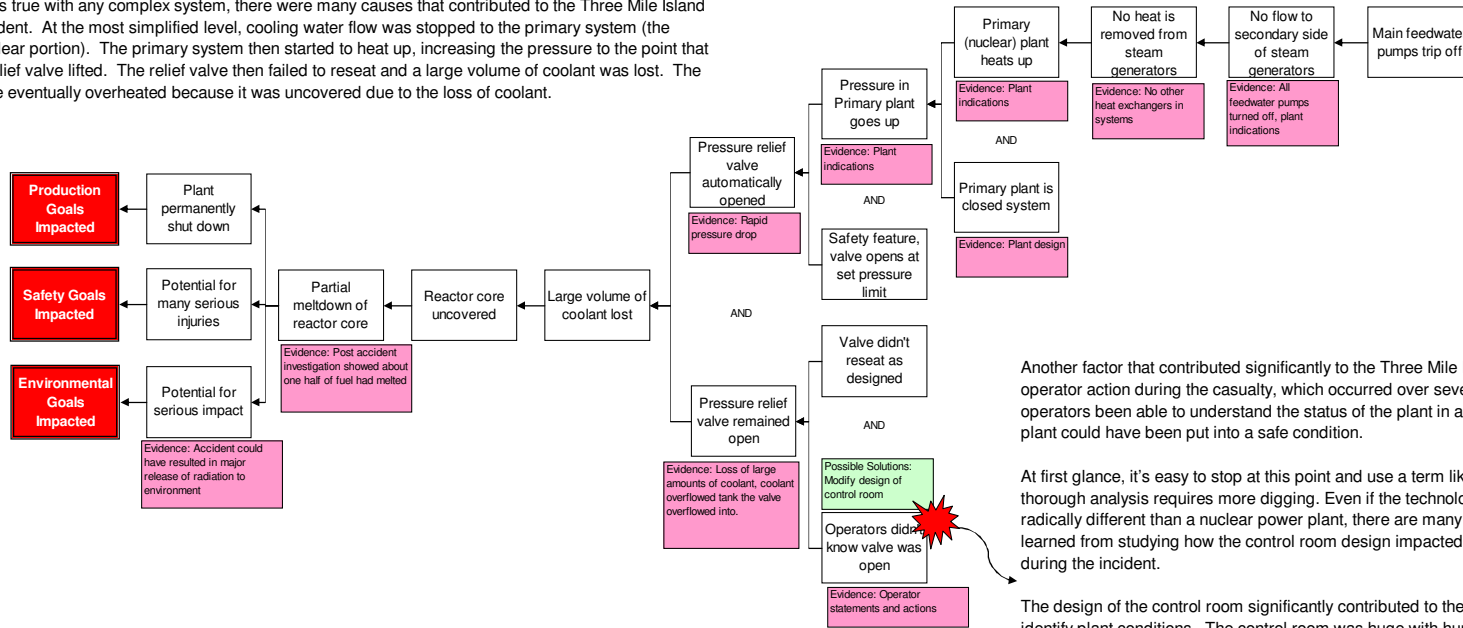
**Three Mile Island**  
**Harrisburg, Pennsylvania**  
**March 29, 1979**

A thorough root cause analysis built as a Cause Map can capture all of the causes in a simple, intuitive format that fits on one page.

Even more detail can be added to this Cause Map as the analysis continues. As with any investigation the level of detail in the analysis is based on the impact of the incident on the organization's overall goals.

The partial meltdown of a core at the nuclear power plant at Three Mile Island is one of the most well known engineering disasters in US history. Luckily, no one was injured and there was no significant environmental impact, but the potential for major issues was very real. Three Mile Island also had a huge impact on the nuclear industry and required a major clean up effort.

Performing a root cause analysis of historical incidents is useful because there are a number of lessons learned that can often be applied across a variety of industries. As is true with any complex system, there were many causes that contributed to the Three Mile Island incident. At the most simplified level, cooling water flow was stopped to the primary system (the nuclear portion). The primary system then started to heat up, increasing the pressure to the point that a relief valve lifted. The relief valve then failed to reseat and a large volume of coolant was lost. The core eventually overheated because it was uncovered due to the loss of coolant.



Another factor that contributed significantly to the Three Mile Island incident was operator action during the casualty, which occurred over several shifts. Had operators been able to understand the status of the plant in a timelier manner, the plant could have been put into a safe condition.

At first glance, it's easy to stop at this point and use a term like "operator error", but a thorough analysis requires more digging. Even if the technology being considered is radically different than a nuclear power plant, there are many lessons that can be learned from studying how the control room design impacted the operator actions during the incident.

The design of the control room significantly contributed to the operators' inability to identify plant conditions. The control room was huge with hundred of instruments to monitor, some of which were on the back of the control panels and couldn't be viewed in the normal watch standing locations. Dozens of alarms, both audible and flashing lights, went off in a very short period of time without any obvious priority. The alarms continued throughout the casualty and the sheer volume of information was nearly impossible to interpret accurately.

Many industries continue to benefit from the lessons learned from the design of the control room.

**Cause Map**  
**Detail Level**



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