



## NASA's Reliability-Centered Maintenance Pilot Program Saves Over \$300,000 in Taxpayer Money

*Project leaders plan to expand program within NASA's Marshall Space Flight Center and beyond*



**Left:** Implementing RCM in the cooling towers at NASA's Central Air Station extended heat exchanger performance, reduced water consumption, and eliminated waste water disposal. **Right:** The Central Air Station's air compressors experience longer run times between oil changes, dramatically reducing compressor life cycle maintenance costs.

In response to a Rocket Propulsion Test (RPT) Program Office initiative, NASA's Marshall Space Flight Center implemented a reliability-centered maintenance (RCM) program for its pressurized systems. The objective was to reduce maintenance and operating costs of aging equipment within critical testing facilities, while also increasing safety, reliability, and efficiency. The Innovative Partnerships Program (IPP) Office conducted vital background research to identify, analyze, and evaluate industry leaders in RCM. This research helped project leaders anticipate the challenges of implementing RCM on pressurized systems, identify key performance indicators, and develop a set of best practices for the development, integration, and implementation of RCM in the pilot program. The resulting pilot was so successful that project leaders have begun to expand across NASA's RPT centers.

## On the Record

“The IPP Office was able to validate the team’s work, giving them the confidence to move forward and know that they were on the right path. IPP’s involvement served to focus the Pressurized Systems team’s attention to the work already being performed in industry and gave them access to companies they couldn’t have reached on their own.”— *Danny Garcia, Technology Infusion Manager, Innovative Partnerships Program Office, Marshall Space Flight Center*

“What we’re trying to focus on is how best to maintain our equipment and test structures so that they can be operationally ready without having to spend money reconditioning, rebuilding, or replacing equipment. Ultimately, the bottom line is cost savings and return on investment.”— *Leonard Nicholson, Aerospace Engineer, Engineering Test Laboratory, Marshall Space Flight Center*

## Benefits to NASA Missions

The RCM program meets NASA’s needs to decrease maintenance and operating costs, extend the life of aging equipment, minimize hazardous work conditions, manage risk, decrease energy consumption, and reduce environmental impact.

- **Significant cost savings:** RCM processes reduce maintenance and operating costs, avoid costly replacement or reconditioning of failed machinery, remove unnecessary down-time or lost work from outages or equipment failures, and provide a significant return on investment (ROI).
- **More reliable systems:** Because RCM processes rely on strong analytics to monitor key failure points, the technicians are better equipped to manage risk, build in redundancies, reduce or eliminate down time, and eliminate single points of failure.
- **More efficient processes:** NASA centers often rely on multiple contractors to handle analysis, operation, and/or maintenance of their systems, which may result in miscommunication, data loss, and inefficiencies. This program will help to systematize maintenance protocols and define performance metrics for engineers, contractors, and maintenance personnel.
- **Safer work conditions:** RCM processes enable remote analysis of systems via infrared cameras, sensors, etc., allowing maintenance personnel to avoid entering potentially hazardous areas.

## Measurable Impact

- **Total annual savings of over \$300,000:** Marshall Space Flight Center implemented RCM within a single facility, the Central Air Station, saving over \$300,000 in its first year.
- **Over \$270,000 in savings for the water tower:** During the pilot project, an ongoing cooling tower water chemistry problem was resolved by implementing basic principles of RCM, leading to cost savings and clean water.
- **Over \$30,000 in savings through oil analysis:** During the pilot project, it was discovered that thousands of dollars were being wasted on unnecessary oil changes in compressors. Rather than regular oil changes every six months, the oil condition is now determined by periodic oil analysis. This dramatically reduces the need for costly oil changes and extends the life of the equipment, offering significant cost savings.

- **Environmental benefits:** More efficient and productive systems led to decreased energy consumption, reduced toxic waste, decreased water consumption, and cleaner water.
- **Future savings:** Marshall Space Flight Center is analyzing the feasibility, cost, and ROI of implementing RCM within the test stands and the helium, hydrogen, and nitrogen pumping stations (which have costly cryogenic-compatible components). These critical facilities are just as large and costly to maintain as the Central Air Station, therefore, project leaders anticipate comparable cost savings.

## Worth Noting

- NASA’s Stennis Space Center has begun a pilot project on RCM.
- NASA’s Glenn Research Center has requested the help of Marshall Space Flight Center engineers in their efforts to implement benchmarking and conduct an RCM pilot project at Plum Brook Station.
- Marshall Space Flight Center’s pilot project implemented RCM principles within a single facility: the Central Air Station. The project team members are currently analyzing other critical testing facilities in order to optimize and extend their capabilities through RCM methodology.

## For More Information

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