

Rapid Lesson Sharing

Event Type: John Deere J Series Dozer Overheating

Location: All units who operate this dozer

Overheating Problem – and the Fix

The John Deere J Series Dozer has overheated during fire operations. When the engine overheats it goes into a limp mode, limiting the dozer's speed and effectiveness. Because the dozer could go into this limp mode during critical times of fire operations, this situation represents a key safety concern. Multiple federal and state land management agencies have worked together with the manufacturer to remedy this problem. After various modifications to the engine cooling system, a design has been developed that fixes this overheating dilemma.



It is the intent of this RLS to tell this story and to spread the word on how this problem can be fixed.

NARRATIVE

Beginning in 2004, various state and federal agencies purchased John Deere J Series Bulldozers. In 2006, agency managers became aware that this model of equipment was frequently overheating. When the engine temperature reaches 235 degrees, it activates engine “de-rate” or limp mode. Operation in limp mode severely limits travel speed.

The engine remains in this mode until it cools to an acceptable and operable temperature.

The equipment manufacturer was notified and began to work with the various agencies to remedy this overheating problem. Initially, the manufacturer believed that the problem could be attributed to equipment operator errors and failure to properly maintain the equipment. The manufacturer provided training opportunities to equipment operators. A large portion of this training was instruction on the proper methods to clean and maintain engine radiators.

However, after this additional training was completed, agencies continued to witness frequent equipment failure.

Interagency Dozer Overheating Steering Team

In 2013, during an above normal wildland fire season, an increasing number of this particular dozer model experienced overheating. Various land management agencies began to communicate with each other and share information on the frequency of these engine overheating occurrences.

Local, state, and federal managers organized an Interagency Dozer Overheating Steering Team to oversee the mitigation of and remedy for this engine overheating issue. On March 27, 2013, the Southern Regional Forester (Region 8) issued a letter that addressed "Overheating Interim Guidance and Risk Management" for the John Deere J Series Dozers: http://gacc.nifc.gov/sacc/PDFs/safety/FS_correspondence.pdf.

The Regional Fire and Aviation Management Operations and Safety Management staff scheduled four meetings across the Region with Forest staff. They specifically invited dozer operators to gain information and explore the possibility that an answer might exist within the field ranks. A risk assessment was conducted during these four meetings to ensure that the information would be organized, categorized, and expressed in terms of hazards to field operations:

http://gacc.nifc.gov/sacc/administrative/safety_mgmt/Dozer_Overheating_Risk_Assessment.pdf

A Regional Safety Alert was issued July 25, 2013:

http://gacc.nifc.gov/sacc/PDFs/safety/R8DozerOverheatingAlert_July2013.pdf

New Retrofit Cooling System is Designed

The Regional FAM Operations staff engaged the Forest Service San Dimas Technology and Development Center in this equipment safety issue. San Dimas readily accepted the invitation. This analysis has been ongoing since February 2013.

The Interagency Dozer Overheating Steering Team initiated further testing modules and began to work more closely with the manufacturer to correct and prevent engine overheating. At this point, the manufacturer began to contribute additional resources such as engineering, consulting of subcontractors, and improved communication to the affected agencies.

In addition, the San Dimas T&D Center worked with a John Deere subcontractor, who provides cooling systems for the particular equipment model. A new retrofit cooling system was designed.

Installation, testing, and further design enhancements of the retrofitted cooling system have now been completed. The current retrofit design increases the heat rejection capacity of the engine cooler by 17% for Tier 2 dozers and 11% for Tier 3 dozers. This was accomplished by increasing the thickness and width of the engine radiators while retaining the Original Equipment Manufacturer (OEM) capacity of the hydrostatic cooler.

On the retrofit design, the number of radiator fins was reduced from the OEM fin design of 10.35 fins per square inch to 6 fins per square inch. The fin design was also changed from a V fin shape to a U shape to allow debris to pass through the radiators more easily and reduce the clogging potential—which has been an issue with the OEM design. Additionally, the thickness of the fins was increased to limit damage caused by restricted air flow.

Inspection can now be complete without removing the radiator from the engine. The current retrofit utilizing parts 705780-4/550J T2, 705781-650J T2 & 705782-4/5/650 J T3 has proven to be effective in preventing overheating when properly maintained. Retrofit costs are approximately \$6,600. For equipment owned by the Forest Service, this is covered by Working Capital Funds (WCF).

LESSONS

- ✓ Communicating and coordination among federal and state land management agencies has led to a good relationship with the dozer manufacturer and sub-contractors to be able to remedy this overheating issue.
- ✓ Proactively completing a risk assessment of dozer overheating issues and communication with field-level personnel provided the appropriate mitigation for safe dozer operations.
- ✓ Managers and equipment operators are to ensure that the modifications to the equipment cooling system are completed. Proper equipment inspections and maintenance are key to prevent overheating occurrences.

RECOMMENDATIONS

- ✓ Conduct thorough preseason inspection of equipment to ensure the radiator is clear of all debris. Newly developed engine temperature testing and radiator restriction testing/cleaning are to be part of preseason inspection.
- ✓ All dozer operators need to be familiar with the Region 8 Dozer Overheating Risk Assessment and ensure that regular scheduled maintenance occurs.
- ✓ Closely monitor equipment engine temperatures and make any adjustments necessary to keep temperatures within the manufacturer's recommendations. This may include modification of given wildfire suppression tactics.
- ✓ Anticipate newly developed engine temperature testing and radiator restriction testing/cleaning methods and procedures to be published and circulated through the Technical Tip format.
- ✓ Continue to coordinate with other agencies and among U.S. Forest Service Regions to achieve standardization of equipment specifications.
- ✓ Identify equipment that are still witnessing overheating issues and ensure that they receive updated retrofits. Such equipment should be taken to a John Deere dealership or a subcontractor who has designed retrofits, such as: GR Manufacturing, Trussville AL; Phone (205) 655-8001; Attn: Paul Hodges.

**This RLS was submitted by:
The Region 8 Rapid Learning Team**

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