



Local Operational Research Assistance (OPERA) Program

Grapple Hook Culvert Cleaner

Every year, Otter Tail County spends thousands of dollars on excavators, jetting services, and backbreaking manual labor to remove beaver dams and other damaging clogs among more than 500 culverts throughout its extensive drainage system.

To broaden the county's culvert cleaning capabilities, Otter Tail County ditch and drainage inspector Colby Palmersheim obtained an OPERA grant for \$1,000 to develop the Grapple Hook Culvert Cleaner. The device, a 7-foot heavy duty post topped by a retractable grapple hook, can shoot through a beaver dam and extract it with a cable connected at the other end to a vehicle-mounted winch.

Grapple hook device removes brush in minutes

County highway maintenance staff had received OPERA funding in 2022 to fabricate the "Otter Claw," a 15-foot skid loader attachment featuring a grapple claw with an omnidirectional hydraulic swivel head to lift and remove dams and other debris. Staff also developed additional hydraulic attachments for cleaning culverts, such as expandable paddle-like shovel heads and flat scraping heads to fit culverts of different sizes. These devices work well on roadside ditches with direct access for machinery, but they do not work on flooded ditches or stream crossings. Excavators and jettors also prove ineffective in similar situations.

Palmersheim collaborated with the local high school welding program to fabricate a grapple hook using scrap metal in his shop. He also purchased from Amazon a portable hitch-mounted winch with a recovery package. The winch is powered directly from the vehicle battery with alligator clips. A wireless remote allows for operating the winch while at the culvert.

The county team refined the design of the device by testing it using a variety of stockpiled culverts jammed with brush. Deployment of the grapple hook and removal of the brush took less than five minutes. Among key lessons learned were that the hook hinges required a thicker gauge of

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OPERA Funding

\$1,000



The Grapple Hook Culvert Cleaner, fabricated with shop scrap metal, has a 1.65-inch diameter hook useful in pipes of at least 24 inches.



Stockpiled culvert jammed with brush



Portable hitch-mounted winch

The Grapple Hook Culvert Cleaner was created to clear most culvert obstructions encountered during regular inspections, saving time, money, and frustration.

steel to avoid twisting and that the device, with a 16.5-inch diameter hook, works best in pipes of at least 24 inches. The team also found it helpful to harden the butt of the post, allowing the use of a sledgehammer to force the grapple hook through thick tangles.

A look to the future

Palmersheim hopes eventually to improve the grapple hook so it can work with smaller culverts and to enable more options for a winch line pivot point. Currently, the system use trees, a recovery strap, and snatch blocks to distribute force and increase mechanical advantage. A ground anchor for locations without strong trees nearby is still in development.

Palmersheim especially likes the portability of the Grapple Hook Culvert Cleaner, which easily fits in his work truck and makes it possible to bypass waiting days or weeks for the help of a contractor. He expects the device to be useful for most culvert obstructions encountered during regular inspections, saving time, money, and frustration, as well as improving work safety. In addition, the collaborative effort to make the device highlights the talent of local students while showcasing county careers and the kinds of problems those workers solve every day.

About OPERA

The Local OPERA Program encourages maintenance employees from all cities and counties to get involved in operational, “hands-on” research. OPERA helps to develop innovations in the construction and maintenance operations of local government transportation organizations and share those ideas statewide.

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October 2024

Local OPERA Program partners: Minnesota Local Road Research Board (LRRB), Minnesota Department of Transportation (MnDOT), and Minnesota Local Technical Assistance Program (LTAP) at the Center for Transportation Studies, University of Minnesota.

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