

CROSSROADS



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Plow blade innovations show potential

Innovations that can increase the efficiency of a plowing operation include advances in blade technology and the introduction of new multi-edge plow configurations.

PLOWING REMAINS the most environmentally sound method of snow and ice control, a staple of winter maintenance operations across Wisconsin and the upper Midwest for generations. New tools and applications that are on the market now can help local street and highway departments improve their use of mechanical removal and their level of service.

Innovations that can increase the efficiency of a plowing operation include advances in blade technology and the introduction of new multi-edge plow configurations.

Useful data on these innovations comes from a national Clear Roads research project that field-tested the performance of prototype multi-edge plows under different conditions and surveyed public road agencies on the performance of the newest cutting edges.

Clear Roads is a pooled-fund research project with 26 participating state DOTs that conducts rigorous testing of winter maintenance materials, equipment and methods for use by highway maintenance crews. Results of the study provide public agencies and equipment manufacturers with information to apply new technologies effectively. Details on the multi-edge plow study are at <http://clearroads.org/multi-blade-plow-prototypes.html>.



Drawing above shows a multi-edge, 3-blade plow configuration with 1) a squeegee blade at the back to clear slush, 2) a scarifying blade in the middle to break up snow pack and 3) the main snow blade in front.



McHenry County plow operators use this two-blade plow configuration to remove snow and slush on their northern Illinois roads. The county is one of the first in the U.S. to experiment with multi-edge plows.

Flexible technology

Two road agencies in neighboring states are among the first county and municipal departments with multi-edge plows in their fleets. Mark DeVries, Maintenance Superintendent for the McHenry County Division of Transportation in Illinois, and John Klostermann, City of Dubuque, Iowa, Street and Sewer Maintenance Supervisor, talk here about their experience using multiple blades and the newest cutting edges in their operations.

The full configuration for a multi-edge plow begins at the front with the main snow blade followed by a squeegee blade at the back to remove slush. Some configurations position a scarifying blade between the front and back blades that breaks up hard-packed snow. Operators can raise or lower each blade separately to select the

combination of blades that will clear the road best based on pavement temperature and precipitation type. Production multi-edge plow units typically use air pressure to lower and raise the edges. This cushions the blades against excess vibration and damage to the cutting edge.

The field tests and road-agency surveys generally showed that the combination clears the road of more snow and ice in a single pass than a conventional plow and reduces the amount of salt needed to achieve bare pavement.

Use of multi-edge plows on both county roads and city streets demonstrates the flexibility of the technology. The three blades each have a distinct job to do in snow and ice control, and are deployed according to conditions and a department's winter maintenance policies.

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Drivers had a feel for when to use the blades together or separately for best results and provided valuable feedback to manufacturers during testing, which served as good training.

Two-blade combo

DeVries describes the multi-edge concept as the best new technology he has seen for improved snow plowing. McHenry County, just south of the Wisconsin/Illinois border, first tested the approach two seasons ago. They put one new truck on the road that year fitted with a two-blade configuration of snow blade in front, slush blade behind. DeVries says they did not purchase the scarifying blade because hard pack is not an issue due to an aggressive anti-icing policy.

"The snow and slush blades working together matched conditions on our roads during a snow event and really focused our efforts," he says, noting that between the new cutting edges that scrape the pavement cleaner of whatever snow is there and the action of the rubber blade, county crews are clearing off 20 percent more slush and snow in one pass. The cleaner road also means the county can "turn down" the amount of deicing salt they use after plowing.

The units have an air-operated slush blade that rises automatically when operators put the plow in reverse. The county worked with Monroe Truck Equipment on the improvement to protect the blade from damage.

"The combination is dynamite," says DeVries. "We won't buy a

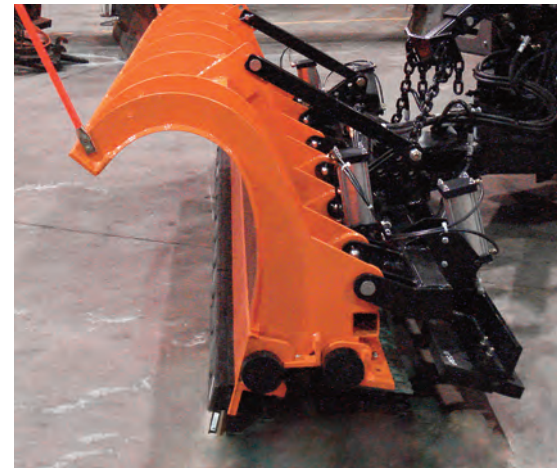
plow without it in the future." McHenry County will put a total of five multi-edge plows on the road for the 2012-13 snow season.

Early results persuasive

With only one light snow season of testing so far, Dubuque has less experience using their multi-edge plows than McHenry County. But Klostermann says the results from the Clear Roads research helped persuade him the multi-edge approach, together with the new cutting edges, was the answer to upgrading of the department's winter maintenance fleet. "I usually wait longer to try a new technology but plowing is the main way we remove snow on our streets so this was an improvement I felt would fit our operation."

Klostermann says Dubuque does not have a bare-pavement policy but the goal is to return city streets to pre-storm driving condition as soon as possible after a snow event. In most cases, the result is bare pavement, which the multi-edge technology supports. The department outfitted three existing trucks with three-blade plows, one from Henke Manufacturing and two from Henderson Truck Equipment. Operators plow primary and secondary routes first. They keep the middle scarifying blade in the up position on these streets because a pro-active anti-icing program prevents snow pack from forming.

Once the main routes are safe for travel, crews focus on residential streets where, if compacted snow exists, the operator has the tools to match conditions. Working three blades together makes sense in these areas, Klostermann says, where the snow pack has time to form. "Even with our limited experience, this appears to be an efficient way to improve our level of service everywhere in the city."



Dubuque deployed a three-blade, multi-blade plow for the first time last year, adding a scraper blade in the middle to remove snow pack.

Improved cutting edges

Some local road officials are putting improved cutting edges by Joma, Polar Flex and Küper to work on their snow plows. DeVries and Klostermann say the tougher, lighter cutting edges contribute to the effectiveness they see in their multi-edge plows. McHenry County uses all three brands on its equipment but the blade of choice on their multi-edge units is the Küper tungsten carbide cutting edge. DeVries reports the edges show little wear after three years. He will test ceramic inserts this season and plans to try them on wing plows.

Klostermann's department has tried the newest cutting edges from both Polarflex and Joma in their multi-edge plows. He says the rubber-encased carbide blades cut through snow and cleaned the pavement better than the double-cutting edges they used previously. Klostermann recommends setting the snow plow "angle of attack" according to instructions from the cutting edge manufacturer, adjustments his operators found improved blade performance.

"Providing equipment makers with feedback from the field is critical with any new technology," Klostermann adds. He and his operators worked with one manufacturer to redesign the plow frame and move the blade about



McHenry County specifies a two-blade plow like this in every new truck purchase.

nine inches closer to the truck to improve maneuverability in tight places and around corners.

See details on Joma, Polar Flex and Küper products at right.

Operators as experts

Once he started investigating the potential of adding multi-edge plows three years ago, Klostermann included discussions about the technology in his annual training program for plow operators. It prepared them in the basics of how the plows worked and what results to expect. The on-the-road experience of last season and trouble-shooting the angle of attack fine-tuned their skills. The operators became the experts.

The training process in McHenry County was similar. DeVries began with the basics and, after only a few runs, drivers had a feel for when to use the blades together or separately for best results. The operators also provided much valuable feedback to the manufacturers during testing, he says, which served as good training.

"They learned quickly how to get the most out of the plows," DeVries adds. "Even the skeptics on the staff are convinced now the multi-edge combination does a better job."

Higher cost, longer life

Costs are higher for the multi-edge plows, a fact born out by what Klostermann and DeVries invested.

Dubuque and McHenry County expect more miles from the combo of more durable cutting edges and flexible multiple blades.

Klostermann says the cost for installing a three-blade unit to the three existing city trucks was \$15,200 each. He explains that is double what they spent on the much lighter plows they used before. "But we plan to almost double the life of these plows to 15 years of service from the eight years we typically expect." He hopes to continue adding multi-edge plows to the city's fleet on an existing replacement schedule.

McHenry County includes its multi-edge plows in a turnkey truck purchase. DeVries says the department paid approximately \$190,000 for each truck delivered with the specified two-blade plow. He estimates adding a third blade to his existing configuration would cost \$2000 to \$3000 more.

Better level of service

Technologies that improve on methods for clearing roads and streets offer a good option for local governments ready to replace or upgrade their plowing equipment. The experience of public road agencies in the region suggests that multi-edge plows and innovative cutting edges can result in a better level of service. Road and street departments using these innovations expect to make fewer passes, which means lower labor

On the cutting edges

Tougher cutting edges are making a difference in winter maintenance operations on paved roads for street and highway departments. Three of the latest are showing up in single- and multi-edge plows, as replacements or in new equipment. Comments summarized here from a Clear Roads survey of local and state highway departments provide a useful profile of each product's performance in the field.

- Joma 6000 has tungsten carbide inserts encased in rubber. Supplied in three foot or four foot segments. *Less vibration, long-lasting edge, cleaner pavement. Less damage to raised pavement markers. Cost more but easy to replace in single sections. Two-to-three times the cost of conventional blades with two-to-four times the useful life. Holds up less well on concrete pavement with deteriorated transverse cracks.*
- PolarFlex has individual 12-inch rubber-encased carbide-tipped steel segments with a reusable mounting element. *Flexible. Less vibration. Runs tight against pavement. Holds up well. Initial cost higher but subsequent insert replacements are less. Handles obstructions easily. Adjust angle of attack to improve performance.*
- Küper Tuca SX Blade has tungsten carbide cutting edge imbedded in steel and rubber. *Cooling openings control blade heat. Quiet. Long-lasting. Five times the cost, three times the life of standard carbide edge.*

and equipment costs. And the cleaner pavements the plows leave behind help winter maintenance crews reduce their salt use.

Local governments can learn more about multi-edge plows on the Clear Roads website and by talking with the manufacturers — Fink, Henderson, Henke and Monroe — who provided prototypes for the Clear Roads studies. ■

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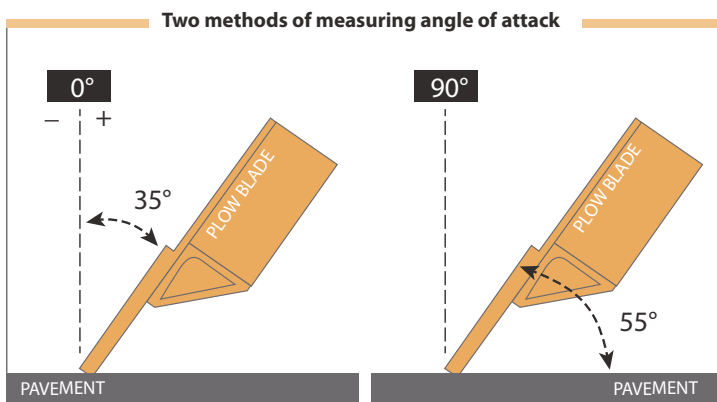
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Resource

<http://clearroads.org/multiple-blade-plow-prototypes.html>

Page on Clear Roads site with links to equipment photos and videos of plows in action.



Cutting edges that use new technology may require a different angle of attack. This diagram shows two ways manufacturers measure this angle. It is important to know which method a manufacturer uses and then set the cutting edge at the correct angle. Start with the angle recommended by the manufacturer and adjust as necessary. Adapted from Monroe Truck Equipment illustration.

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