Viking-Cives TowPLOW Evaluation

Division of Operations
Office of Maintenance Administration

May 2011

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Executive Summary
In today’s snow and ice operations world, highway maintenance agencies are struggling to provide snow and ice removal services at the same high level the travelling public has come to expect through the years. Decreased operating budgets combined with the increased cost of needed resources have forced agencies to modify operational procedures that adapt to these limitations but continue to provide safe, passable roadways in the winter months. The Ohio Department of Transportation (ODOT) is no exception to these circumstances.

Highway maintenance representatives from ODOT’s District Four recognized that the addition of the TowPLow to the Department’s snow and ice removal fleet could potentially increase driver productivity, reduce expenses, and provide the higher level of service demanded by today’s travelling public. As a result, Viking-Cives, Ltd. agreed to loan ODOT’s Ashtabula County in northeast Ohio a TowPLow for testing during the 2010-2011 winter season.

The TowPLow, manufactured by Viking-Cives, Ltd. of Mount Forest, Ontario Canada, functions as an accessory to a standard front mounted snow plow similar in concept to that of a side mounted wing plow. However, the TowPLow offers a greater range of motion, more versatility, and better operator control when compared to the standard wing plow. Simply stated, the TowPLow is a trailer, equipped with a snow plow that is towed behind a tandem axle truck fitted with a front plow. When in operation, the trailer swings to the right of the tow vehicle enabling the operator to plow a second lane in addition to the lane plowed by the front mounted plow.

Ashtabula County utilized the TowPLow on three different routes throughout the winter; State Route 11, Interstate 90, and US Highway 20. All three routes are similar in that they are multilane, but each route has unique characteristics that presented a wide range of testing scenarios and challenges.

Ashtabula County successfully incorporated the TowPLow into their snow and ice operations and established substantial evidence supporting effective application on multiple route types. Utilizing the TowPLow, the County plowed and treated the roadways more effectively and efficiently reducing overall usage of fuel, labor, and material resources while providing a higher level of service and safer pavement conditions for the travelling public.

Adding the TowPLow to Ashtabula County’s snow and ice equipment fleet on a permanent basis will strengthen operations and allow for more efficient use of the County’s resources. While there are a few areas of concern, the TowPLow offers numerous benefits offsetting these concerns. Considering operator buy-in, overall increase of driver productivity, and effective plowing and treating operations, the TowPLow has the potential to be a key asset for Ashtabula County and District Four for years to come.
Introduction
In today’s snow and ice operations world, highway maintenance agencies are struggling to provide snow and ice removal services at the same high level the travelling public has come to expect through the years. Decreased operating budgets combined with the increased cost of needed resources have forced agencies to modify operational procedures that adapt to these limitations but continue to provide safe, passable roadways in the winter months. The Ohio Department of Transportation (ODOT) is no exception to these circumstances.

ODOT has implemented several strategies to operate more efficiently and continue to provide effective snow and ice removal services. These strategies have included establishing priority routes, increasing the use of liquid de-icing chemicals, adjusting material application guidelines, and educating drivers on material usage awareness. Nevertheless, ODOT continues to research and examine new or alternative methods that can potentially improve snow and ice operations.

New technologies are regularly introduced to highway maintenance agencies for the purposes of enhancing snow and ice removal from roadways. One such technology was recently introduced to the snow and ice community by snow removal equipment manufacturer Viking-Cives, Ltd. The TowPLow enables agencies to more efficiently and effectively remove snow and ice from roads by outfitting a tandem axle plow truck with a trailer mounted plow. With the TowPLow, one truck and one driver can clear and treat two lanes of pavement, essentially clearing an equal width of pavement and treating the road surface with an equal quantity of material as two plow trucks and two plow drivers.

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Description
The TowPLow, manufactured by Viking-Cives, Ltd. of Mount Forest, Ontario Canada, functions as an accessory to a standard front mounted snow plow similar in concept to that of a side mounted wing plow. However, the TowPLow offers a greater range of motion, more versatility, and better operator control when compared to the standard wing plow. Simply stated, the TowPLow is a trailer, equipped with a snow plow that is towed behind a tandem axle truck fitted with a front plow. When in operation, the trailer swings to the right of the tow vehicle enabling the operator to plow a second lane in addition to the lane plowed by the front mounted plow.
According to the manufacturer, the TowPLow is ideally designed for multilane, tandem plowing at normal highway speeds up to 55 miles per hour. The unit utilizes standard steel plow blades attached to 30 inch high front and rear moldboards 12 and 14 feet in length respectively for a total moldboard length of 26 feet. In combination with a 12 foot front plow, the TowPLow can clear a path 24 feet or more wide and operate at any angle up to 30 degrees. The TowPLow is hydraulically operated using two in-cab controls; one to steer the plow and one to lift the blade up and down. For optimal performance, the unit requires ballast on the trailer wheels. Depending on the user’s needs, this is accomplished with the addition of a 1000 gallon liquid poly tank, eight cubic yard solid material hopper with a spreader, or a combination of a poly tank and material hopper. Additionally, the TowPLow lighting configuration meets standard trailer lighting requirements; however, other options are available to meet jurisdictional needs.

**Equipment**

The TowPLow utilized by Ashtabula County is equipped with a six ton capacity hopper and material spreader positioned underneath the trailer directly in front of the hopper. This configuration allows the operator to not only plow a second lane but treat the second lane with salt as well. However, the unit does not have a liquid poly tank, therefore, cannot pre-wet salt as it exits the spreader.

To adequately pull the TowPLow and utilize the plow to its full potential, the tow vehicle requires additional horsepower than ODOT’s current standard build truck. As a result, a 1998 International 2574 tandem axle dump truck with 350 horsepower was transferred from Stark County to serve as the tow vehicle. Included on the tow vehicle are a 12 foot front plow, a 10 ton live bottom hopper, and four 70 gallon saddle tanks.

Several modifications were made to the tow vehicle to accommodate the TowPLow and help the driver operate the system safely. The towing package was upgraded to match the manufactures specifications for the hitch and trailer wiring. The truck’s existing hydraulic controller operates the TowPLow, but the system had to be altered to facilitate its steering, lifting, and spreading functions. The material output of the TowPLow is controlled by the same hydraulic switch as the truck’s spreading system. As a result, the tow vehicle and TowPLow deliver material to the pavement simultaneously. Additionally, two other hydraulic switches, normally used for the control of a wing plow, were designated for the control of the
right and left movement of the trailer and the up and down movement of the plow blade. To ensure adequate material application from the truck, the spinner on the spreading system was removed and replaced with a chute that directs the salt to the left of the trailer tongue. Two cameras, one on the passenger side mirror and one on the rear of the hopper, were mounted to the truck to help the driver monitor the position of the trailer. A third camera was mounted on the TowPLow to monitor the quantity of material remaining in the hopper. The camera images are viewed on a screen positioned in the typical location of the rearview mirror. Only a single image can be viewed at a time, but the driver can change from one camera to another via a switch on the video equipment. In all, the modifications cost approximately $5,000.

Training
When the TowPLow was initially delivered, Viking-Cives Ltd. provided basic instruction on how to operate the unit, but extensive individual training was not included. To ensure each driver had a complete understanding and felt comfortable operating the TowPLow, Ashtabula County management provided hands-on, individual driver training. The drivers first familiarized themselves with the general aspects of towing and controlling the unit in a closed parking lot. These steps allowed the drivers to safely and comfortably maneuver the unit, deploy and retract the unit, lower and raise the plow blade,
and learn how to operate the TowPLow without any outside distractions. Once the drivers felt comfortable with the general operation, each driver completed two to three days of dry-run training. During normal driving and weather conditions (i.e., not snowing), each operator drove the unit on the routes where the TowPLow was to be utilized throughout the winter. This process permitted the drivers to operate in live traffic conditions, locate optimal turnaround sites, maneuver around obstacles, and determine any potential problems in preparation for actual plowing operations. Finally, each driver was accompanied by a manager for their first operation in snow and ice conditions. After three to four hours in live snow and ice conditions, the drivers felt comfortable operating the TowPLow on their own.

**Operation**

Ashtabula County utilized the TowPLow on three different routes throughout the winter; State Route 11, Interstate 90, and US Highway 20. All three routes are similar in that they are multilane, but each route has unique characteristics that presented a wide range of testing scenarios and challenges.

The initial operation of the TowPLow took place on State Route 11, a rural north/south divided highway with two lanes in each direction and an AADT of 9,000 vehicles. Due to the low volume of traffic, this route was ideal for the drivers to operate and determine how to best incorporate the TowPLow into the County’s existing operations. Almost immediately, the drivers noticed that they did not have to repeatedly clear the same lane of pavement. Under conventional operations, one truck first plows the driving lane and then plows the passing lane. By the time the driver returns to complete the second pass on the driving lane, the pavement is already covered with snow and slush thrown from the wheels of vehicles travelling on the route. With one pass of the TowPLow, both the driving and passing lanes are plowed and treated, the pavement remains clear for a longer period of time, and the drivers do not have to chase snow and slush from lane to lane.

After demonstrating that the TowPLow could effectively plow and treat two lanes of pavement, the TowPLow was utilized on the entire length of State Route 11 from the Ashtabula City limits to the Ashtabula/Trumbull County line. On this stretch of State Route 11, the County is responsible for approximately 120 lane miles of pavement and normally utilizes three plow trucks to cover the mainline lanes and ramps. By utilizing the TowPLow on the mainline, the three plow trucks that typically cover the route were free to concentrate on the ramps and shoulders. This arrangement opened the
travelling lanes and ramps sooner providing improved level of service and safety to the motoring public. All four mainline lanes of State Route 11 could be plowed and treated at least once in approximately two hours.

With encouraging results from the initial tests on State Route 11, the TowPLow drivers were eager to operate the plow in more challenging conditions. As a result, the TowPLow was next utilized on Interstate 90, a rural east/west interstate with two lanes in each direction and an AADT of 25,000 vehicles. The higher traffic volume and increased interaction with the travelling public posed potential challenges maneuvering the TowPLow and impeding traffic flow.

On Interstate 90, the drivers could not turnaround at the normal crossover locations. With the added length of the TowPLow, there was not adequate space to safely stop in the crossovers as the back end of the TowPLow would extend out into the oncoming traffic. Unless the traffic volume was low, usually at night, and the TowPLow could be driven through the crossover in a continuous motion, the drivers simply turned around at the next interchange. Although this may have required driving a few extra miles to turnaround, it did not negatively impact operations and was significantly safer for the public and driver than the alternative.

When deployed, the TowPLow operators could easily view the status of the TowPLow via the passenger side mirror and corresponding side mounted camera. However, they had difficulty viewing traffic behind the TowPLow. Typically operated at 35 to 40 miles per hour, faster moving traffic could not pass the TowPLow and tended to build up behind the unit until the plow was disengaged or the driver turned around. The camera mounted at the back of the tow vehicle was intended for the driver to see the traffic behind the unit, but blowing snow usually covered the camera rendering it useless. Nevertheless, in hazardous road conditions, the travelling public recognized that the TowPLow aided rather than hindered their travels and usually understood when they could not pass for a short period of time. Throughout the snow and ice season, Ashtabula County only received one complaint concerning the TowPLow from a driver unable to pass the plow on Interstate 90.
In spite of locating alternate turnaround locations and impeding traffic flow, the operation of the TowPLow on Interstate 90 was a success. As one Ashtabula County Transportation Manager commented, by means of the TowPLow and one additional plow truck, this was the first time he had seen Interstate 90 cleared in one pass from grass to grass in 32 years of service.

Based on the success achieved on State Route 11 and Interstate 90, the County decided to use the TowPLow on US Highway 20, a route not initially thought to be suited for the TowPLow. An east/west undivided highway with two lanes in each direction and an AADT of 11,000 vehicles, US Highway 20 presented the challenges of an urban setting with curb and gutter, decreased speeds, traffic signals, pedestrian crossings, driveways, turn lanes, mailboxes, etc. Essentially, the TowPLow driver had to be more aware of the surroundings as there were more obstacles to maneuver around and less room for error. Keeping the plow off of the curb and finding areas to turnaround, proved to be the two biggest obstacles to overcome while operating the TowPLow on US Highway 20. However, as long as the driver kept the plow blade approximately three feet from the curb and was familiar with the available turnaround locations, the TowPLow once again effectively and efficiently provided improved level of service and safety to the travelling public. With a single plow truck, the section of US Highway 20 where the TowPLow was utilized, normally takes three hours to plow and treat one pass on all four lanes. With the TowPLow, this same section of highway took 45 minutes to complete one pass on all four lanes.

Usage
Ashtabula County incorporated the TowPLow into their snow and ice operations on 16 days throughout the season for a total of 192 hours. The County primarily utilized the TowPLow for larger events, typically waiting until three to four inches of snow had fallen before they deployed the plow. Since the TowPLow was loaned from Viking-Cives, the County chose not to overuse the unit and increase the chances of damaging it. However, if purchased, the County acknowledged that they plan to use the TowPLow in smaller one to two inch storms as well.

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| Total Usage: 192 hours on 16 days |

Driver Feedback
When introducing new technologies into operations, the users of the technology are usually the most important critics. As such, it is essential to receive honest feedback from the users when it comes to evaluating the success or failure of the technology. Initially, the Ashtabula County plow drivers were skeptical of the TowPLow. Most drivers were not confident in the TowPLow’s ability to plow snow and believed it would actually hinder rather than aid operations. Others simply did not want the added responsibility associated with operating the TowPLow.
As the drivers designated to operate the TowPLow began to drive and train, they soon realized the TowPLow was not as difficult to operate as first thought. The in-cab controls are simple to operate and do not interfere with the normal operation of the front plow and spreader controls. When deployed, the TowPLow swings out smoothly and retracts quickly when maneuvering around guardrail, bridge parapets, stranded vehicles, and other obstacles along the roadway. The weight of the TowPLow does not jerk the tow vehicle from side to side, and as the material hopper empties, the trailer does not drift. The plow is clearly visible via the passenger side mirror and camera, but the traffic behind the unit can be difficult to see. As a result, the drivers are concerned they may not recognize approaching emergency vehicles and block them from passing.

After becoming comfortable operating the TowPLow in actual snow and ice conditions, the drivers recognized that the TowPLow aided their efforts more than it hindered them. By plowing two lanes with a single pass, the drivers discovered they could clear lanes faster, keep pavement open longer, prevent hard pack from forming, and reduce clean up time after storms. Additionally, the drivers did not have to repeatedly plow the same lanes to remove snow and slush thrown from one lane to the other lane by passing vehicles. Even plow truck drivers, who do not operate the TowPLow, noticed the benefits of its use as well. After seeing the results from operating on State Route 11, drivers from the outposts in the southern part of the county asked to have the TowPLow assist in their snow removal efforts. With the TowPLow opening the mainline lanes of State Route 11, the drivers recognized they were free to concentrate on clearing ramps, shoulders, and other routes, providing a better level of service and completing operations earlier.

**Public Awareness**

Prior to the beginning of the 2010-2011 snow and ice season, the District Four Office of Communications made sure the travelling public was well-informed regarding Ashtabula County’s implementation of the
TowPLow. Due to the direct interaction with vehicles and potential to impede traffic, communicating with the public was important to ensure drivers knew what to expect when encountering the TowPLow. A media day was held at the Ashtabula County garage in November. At the event, local media outlets were able to observe the TowPLow and learn how the new technology would be utilized by the County. Following the media day, several on-air news reports and newspaper articles appeared throughout northeast Ohio and other areas of the state introducing the TowPLow to the public.

Even with the potential to impede traffic, the travelling public in Ashtabula County accepted the TowPLow. The majority of motorists recognized that the TowPLow provided improved road conditions in inclement weather. As such, the County fielded only one complaint during the snow and ice season. In fact, many more compliments were received than complaints. On several occasions, the drivers of the TowPLow received praise from truck drivers commenting on the condition of the roads plowed and treated with the TowPLow.

Benefits
Incorporating the TowPLow into Ashtabula County’s snow and ice operations proved to be a valuable addition to their snow and ice removal fleet. The County discovered several aspects of their operations that significantly benefitted from utilizing TowPLow.

- Increases the overall level of service provided to the travelling public
- Provides safer road conditions
- Plows and treats more lanes faster and more efficiently
- Maintains favorable pavement conditions longer
- Limits snow and ice from bonding to the pavement
- Frees trucks to plow and treat areas of need – ramps, shoulders, other routes, etc.
- Completes snow and ice operations faster – less fuel, labor, and material
- Requires less cleanup after the storm
- Decreases equipment maintenance

Concerns
Ashtabula County identified the following concerns regarding the implementation of the TowPLow into their snow and ice operations.

- Impeding traffic flow – most importantly emergency vehicles
- Striking obstacles on the shoulder not visible in white-out conditions (e.g., stranded vehicles)
- Visibility of the TowPLow in blowing snow – especially snow thrown from the front plow
- Breaking down of the tow vehicle effectively downs two trucks unless another truck is capable of towing the plow
Improvements

Prior to purchasing the TowPLow, several improvements to both the TowPLow and tow vehicle should be considered. Although not necessary to achieve positive results, these advancements will simplify operation for the drivers, ensure the system is utilized to its maximum extent, and help to alleviate some of the concerns.

- **TowPLow improvements**
  - Include a poly tank for pre-wetting salt
  - Add a laser alignment system to define the edge of the plow
  - Position a camera at the rear of the TowPLow to view traffic behind the unit
  - Install a hubodometer on the trailer wheel for tracking the TowPLow’s usage

- **Tow vehicle improvements**
  - Purchase a truck with added horsepower and torque to increase towing performance
  - Move the material spreader under the truck frame behind the cab to enhance material application coverage (current application is altered by the trailer tongue)
  - Clearly identify the hydraulic lines for easier trailer connection

Conclusion

Ashtabula County successfully incorporated the TowPLow into their snow and ice operations and established substantial evidence supporting effective application on multiple route types. Utilizing the TowPLow, the County plowed and treated the roadways more effectively and efficiently reducing overall usage of fuel, labor, and material resources while providing a higher level of service and safer pavement conditions for the travelling public.

Adding the TowPLow to Ashtabula County’s snow and ice equipment fleet on a permanent basis will strengthen operations and allow for more efficient use of the County’s resources. While there are a few areas of concern, the TowPLow offers numerous benefits offsetting these concerns. Considering operator buy-in, overall increase of driver productivity, and effective plowing and treating operations, the TowPLow has the potential to be a key asset for Ashtabula County and District Four for years to come.

In fact, the TowPLow introduces a wealth of opportunity for the Ohio Department of Transportation as a whole to move towards more efficient and effective snow and ice removal operations. Given the success achieved in Ashtabula County, the TowPLow may have even greater potential in other areas of the state. Most interstates throughout the state including I-271 in Cleveland, I-270 in Columbus, I-75 between Dayton and Cincinnati, and I-71 between Columbus and Cleveland are well-suited for the application of the TowPLow. With multiple lanes and high volumes of traffic, implementation of the TowPLow in these areas will positively impact the plowing and treating of interstate highways providing improved level of service for the travelling public and reduced resource consumption for the Department.