

MATERIALS & RESEARCH DIVISION

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RESEARCH UPDATE

Number U94-4

SHRP PROTOTYPE SNOW SCOOP

REFERENCE: WP 93-R-27

INTRODUCTION:

The Strategic Highway Research Program (SHRP) product catalog, first published in 1992, includes a brief history and description of the program in its introduction. That material is included here as background information:

SHRP was established by Congress in 1987. The purpose of the program is to improve the performance and durability of the nation's roads and to make those roads safer for both motorists and highway workers. Funding for the program comes from a set-aside of one quarter of one percent (0.25%) of the Federal Highway aid funds that were apportioned to the states. The program has targeted research in four areas: highway operations, concrete and structures, asphalt, and pavement engineering. SHRP is administered as a unit of the National Research Council and in cooperation with the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO). As a result of SHRP's research contracts, one hundred and thirty products in varying stages of development have emerged and have been listed in a catalog. The FHWA is taking the lead in helping state, county and local highway agencies make effective use of SHRP's products.

One of the listings in the SHRP catalog attracted the interest of the Vermont Agency of Transportation's Maintenance Division personnel during the summer of 1993. The offered product was an experimental, energy efficient snowplow design.

The "SHRP Snow Scoop" is constructed of 25.40 mm (1.00 in.) thick, ultra-high molecular weight polyethylene. It measures 215.9 mm (8.5 in.) in height and can be purchased with a length to fit virtually any plow. The scoop is designed to be retrofitted to the moldboard of the standard plow at a forty five degree angle from the horizontal. The intent of the design is to improve plowing efficiency by smoothing the flow of the snow onto the moldboard, thus reducing the snow cloud and improving visibility for both the operator and the motorists following him. Research by the developer has also indicated that fuel efficiency and improved driver control are achieved. Catalog literature states, "When mounted on virtually any plow blade, the scoop improves plowing efficiency." The snow scoop is produced and

distributed by WOTCO Inc., Casper, Wyoming.

PURPOSE:

The purpose of this research update is to document the performance of the snow scoop on one of Vermont's interstate highways.

INSTALLATION:

The evaluation was conducted within Vermont Agency of Transportation District 6 (Central Vt.) boundaries and the designated plows operated on Interstate 89 from Williamstown to Waterbury, Vermont.

Serious problems were encountered when maintenance crews retrofitted the snow scoops to the Vermont Agency of Transportation's one-way Everest plows. Rib locations on the plows were not equidistant from each other, nor were they the same for all plows; therefore, it was difficult to place the bolts for the mounting struts so that the snow scoops could be interchangeable for all plows. Also, dimensions for the spacers to be placed between the mounting struts and the standard plow moldboard were inappropriate and new ones had to be fabricated to meet the requirement for the 45 degree angle between the snow scoop and the plane horizontal to the standard plow cutting edge. Inconsistencies between the shop drawings submitted by the manufacturer and the selected standard plows complicated the retrofit process significantly and resulted in substantial overruns in the time allotted for the work.

DISCUSSION:

It should be noted that prior to beginning the evaluation, Agency personnel had received four reports from states that had tested the equipment. North Dakota, New Hampshire, California and Iowa all reported problems with the snow scoop. Additionally, when a video produced by WOTCO was reviewed prior to arrival of the snow scoop, the content created the impression (subsequently proven to be correct) that the design of the scoop was intended primarily to improve the efficiency of reversible plows with steep vertical plowing angles. Since the Vermont Agency of Transportation uses one-way, angled plows, it seemed reasonable to assume that little or no benefit would be derived by use of the SHRP equipment.

The snow scoop field evaluation began during the heavy snowfall on January 4, 1994. Participants were three plows, (two with and one without the scoop) and an observer driving a passenger vehicle behind each of the snowplows at varying times. Information was exchanged between the plow operators and the observer, and comparisons were made. The evaluation continued under varying conditions through five storms and 160 hours of operation.

The following observations were made:

1. No benefit in reduced snow cloud was perceived.
2. No benefit in improved driver control or increased energy efficiency was noted.
3. Snow tended to accumulate between the scoop and the moldboard of the standard plow, requiring the operator to stop periodically to remove the packed snow.
4. The packing of the snow between the scoop and the moldboard caused the scraping edge of the scoop to raise up slightly, significantly affecting the ability of the plows to scrape the road surface cleanly, particularly in icy conditions or hard snow pack.
5. The limited experience with the snow scoops has already shown them to be extremely susceptible to operation related damage. One of them failed after only five days of use. The failure was due to breakage of two of the mounting bolts on the frame of the scoop.
6. On several occasions, plow operators had to tighten mounting bolts that had loosened due to normal vibrations set up by plowing operations.
7. Under certain conditions, slow plowing speeds are necessary (e.g., at intersections or when hampered by slow moving traffic). When plowing at slow speeds, excessive amounts of snow tend to build up, both on and in front of the plow.
8. Often, during snow removal operations, the operator must lift up the plow. At that point, the snow which has built up between the scoop and the plow drops, and large piles of snow are left in the road, creating a traffic hazard.

The Vermont Agency of Transportation snow plow operators were quick to conclude that the Snow Scoops not only offered no real advantages, but were a deterrent to snow removal operations. After 160 hours of evaluation the program was terminated.

CONCLUSIONS/RECOMMENDATIONS:

1. The relatively narrow range of operating conditions and snowplow designs under which the snow scoops can function effectively should be more specifically described in the SHRP catalog, giving potential purchasers a better basis for decisions relative to the appropriateness of their use in their particular sphere of operation.
2. Outside of the remote possibility that the Vermont Agency of Transportation would refit its fleet with reversible plows with a steep vertical angle, no further evaluation or use of the snow scoop is recommended.

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