When it comes to snowplowing operations, most public-works agencies historically have applied an ad-hoc approach, defined by geography and relying on individual drivers to navigate through a route based on the driver’s perception of efficiency.

In 2012, the city of Centennial, Colo., and CH2M Hill became among the first in the U.S. to use optimized snowplow routing solutions to enhance transportation efficiencies. The results have been nothing short of phenomenal, resulting in a reduction of plowing time of up to 40%.

Centennial, with a population of approximately 103,000, and CH2M Hill, a Colorado-based consulting, design, design-build, operations, and program-management firm, have been engaged in a public-private partnership for public-works services, including snow-removal operations, for the past four years. It is believed to be the largest partnership of its kind in the U.S. The optimized routing project is among several innovations that
The engineering problem associated with snowplow routing is the Chinese Postman Problem, an arc routing problem that seeks the shortest route along a network of roads where each road is covered only once.
drivers were able to perform at the same level as experienced drivers because route memorization and familiarity were no longer a requirement for success. The drivers maintained the optimized snowplow routing solution with the aid of the Garmin devices.

**Plowing right through**

The increase in efficiency was tremendous. The city of Centennial uses automatic vehicle location/global positioning system (AVL/GPS) to track and monitor performance of plowing operations. The time for completing snowplow routes is recorded for each storm with AVL/GPS. The time for completing the Priority One and Priority Two system, under the traditional operating philosophy, during a 12-in. snow event on Dec. 21, 2011, was eight hours. The time under the optimized snowplow route methodology during a 15-in. snow event on Feb. 2, 2012, was 5.5 hours. A 4-in. snow event was managed in 4.5 hours on Feb. 23, 2012. Snowplowing operations experienced an increase in efficiency of 28% on the first implementation and more than 40% on smaller events.

Route optimization has transferable benefits to other public-works operations. In Eldorado, N.M., a CH2M Hill water and sanitation project has utilized route optimization for meter reading. Savings were even greater than the snow-route optimization. The process for developing the routes was very similar and involved engaging staff and routing specialists to create a collaborative approach. The final product produced the following savings:

- Reduced miles driven by 48%, or an average of 3,873 miles per year;
- Decreased fuel costs by an estimated 66%;
- Cut labor hours by nearly 50%;
- Lowered CO₂ emissions by 48%, or 2.2 metric tons; and
- Cut the read cycle by one day.

In summary, route optimization produced a high rate of return on investment. Savings were immediate and sustained. Operational efficiencies can be used to reduce resource requirement or increase service delivery. Many organizations use the increased resource capacity to attack maintenance backlogs that have grown from previous reductions in force or budget. An additional benefit is the collaboration of all members of the work force to propel the organization forward and achieve a collective solution. R&B

Information for this article provided by CH2M Hill.

For more information about this topic, check out the Maintenance Channel at www.roadsbridges.com.