



## Reclaiming — great tool for asphalt pavements

Traditionally, deteriorated asphalt pavements were fixed in two ways: overlays or complete reconstruction. Reconstruction is costly and results in a large amount of waste material that must be disposed of. Overlays tend to develop excess crown on the road and quickly crack in the same places as the underlying pavement (called reflective cracking).

A third choice that is gaining in popularity is reclaiming. A pulverizer or milling machine breaks up the existing asphalt surface, leaving the material to be reused as a base course for a new pavement mat.

"I knew the first time I saw it that this is what we were going to do in Outagamie County," says Highway Commissioner Mike Marsden. They bought a reclaimer three years ago for rejuvenating their own roads and also to contract for reclaiming work in nearby towns and counties. "When you get done it looks like a brand new road. There's no reflective cracking, it's reshaped, and you get a uniform mat. I expect these roads to last 14 to 16 years, the same as new bituminous pavement."

The first step, though, is knowing the existing road: how much and how good is the base, how thick is the mat, and what are the reasons for any localized problems like rutting or alligator cracks. Using records and taking core samples, the engineer or contractor can find out what's there and what is needed. It's also important to determine how much and what kind of traffic the road is carrying, or will carry in the near future.

"The method you choose should follow your goal," says Bill Kahl of WK Construction in Middleton. "You would not build a high volume county road the same as a low volume town road or a parking lot."

### Reclaiming techniques

Road builders, who are constantly improving their methods for producing better roads at the lowest cost, offer various approaches to reclaiming.

*Grinding* Reshaping the surface of a pavement to improve the ride or correct rutting. Can be used on both asphaltic and concrete pavement. The grindings can be recycled.



Reclaiming uses old asphalt pavement to strengthen the road.



### Pulverize and use as base

The least expensive and most popular approach, currently, is to use a machine like a

giant rototiller to break up the full depth of the asphaltic pavement, usually to about six inches. The pulverized material can be reshaped with a grader and compacted to become the base

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## Idea Exchange

### Hydraulic pipe end reshaper

Crushed culvert ends are a common rural road maintenance problem. The lack of proper flow means water backs up in ditches and saturates the road base. From Oklahoma comes this idea for a hydraulic powered jack that quickly reopens culvert ends.



The device is a welded hydraulic cylinder with a scissors jack attached to the actuating rod. Collapsed, the jack fits inside the crushed pipe end. When the cylinder is retracted the jack expands, opening the pipe end in just seconds.

Several reshapers are in use in Oklahoma and Arkansas. You can make one for about \$300 in materials costs. Parts are "off the shelf" and assembly requires minimal machining and welding.

Contact the T.I.C. for a set of plans. From the April 1997 *Oklahoma LTAP News*.

### One-person crack filling

Loading an air compressor on a truck bed while the truck pulls an asphalt kettle has allowed the City of Clive, Iowa, to fill cracks with a one person crew. The crew uses a water emulsion crack filler called *Styrelf*. Agricultural lime dries the filler quickly, preventing wet asphalt from splattering on passing cars. The program saves time and labor, according to Clive Public Works Director Willard Wray. Last year his crew was able to fill cracks on all of Clive's busy streets and half of its residential ones. The program also helps reduce future maintenance—workers did not have to fill any potholes in 1996.

From the February 1997 *Iowa Technology News*. For information contact Willard Wray, 515/223-6230.

### Beaver flood control device

When beavers use their legendary engineering skills on road culverts, the resulting ponds can damage road bases and flood pavements. From New York comes this solution: extend the culvert with a wire mesh "pipe" that produces a quieter water flow since beaver are attracted by the sound of flowing water.

Use concrete wire fabric (4 x 4 inches, 10-gauge wire) to make a rolled tube the diameter of the pipe. Since the mesh must be strong enough to support a beaver's weight, chicken wire won't work. The wire pipe must be at least four feet long and longer is better. Cover the end with another piece of wire fabric.



For help with beaver problems contact your nearby Wisconsin DNR office. A booklet, **Beaver Damage Control**, is available from WDNR, P.O. Box 7921, Madison, WI 53707. From the Fall 1996 newsletter of the Cornell Local Roads Program.

## Crossroads

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## Plastic culvert liners cheaper, easier

You can rehabilitate deteriorating metal culverts by installing plastic liners. When culverts are still round, but rust or bacterial action has weakened them, plastic slip-lining can be cheaper, faster, and easier than excavation and replacement, according to a WisDOT report, *Culvert Pipe Rehabilitation Using Slip-Liners*.

Slip-lining has been around for many years. In a 1994 project, WisDOT rehabilitated a number of culverts, including corroded aluminum culverts, under high volume roads. Three types of HDPE and PVC pipes were installed in Juneau and Marathon Counties. When the culverts were inspected three years later, all but one of the liner types were performing adequately and showed no deterioration.



Plastic liners are an economical alternative to culvert replacement.

Slip-lining was 52% less expensive than conventional metal culvert replacement which involves excavating, replacement, backfilling and paving. During road reconstruction slip-lining is about 4% less. This does not calculate any costs for detouring traffic or for traffic delays or potential crashes associated with traditional excavation and replacement.



Plastic liners have higher flow rates than corrugated metal. Grout fills the cavity between liner and culvert.

Hydraulically, reducing culvert diameter with a liner can be offset by the plastic's higher flow rate. It is smoother, so a smaller culvert can often carry as much water as the larger corrugated metal culvert it is replacing. Inlet control can be a problem and should be evaluated.

While the plastic liners are relatively simple to insert using common highway department equipment, grouting between the liner and the old culvert generally has been done with a concrete pump. It can be expensive because there are not many alternatives available.

For a copy of the report, *Culvert Pipe Rehabilitation Using Slip-Liners*, #WI-01-97, contact the WisDOT, Pavements Section, 3502 Kinsman Blvd., Madison, WI 53704.

## Inspect culverts regularly

It is easy to ignore culverts until the road surface sinks over them and there is an emergency. Rust and bacteria (in north central counties) take a toll on galvanized steel culverts, and road salt can seriously damage aluminum culverts under higher volume roads. Routine culvert inspection allows you to plan and budget for their replacement. WisDOT corrosion specialist Bob Patenaude developed the following rating scale. Concrete and aluminum culvert scales are available.

To get corrosion rating sheets for concrete, aluminum, and steel culverts, call, fax or write the T.I.C.; see page 7.

### Corrosion ratings for zinc galvanized steel pipe

Rating	Condition of pipe
0	No corrosion. Galvanizing or cladding intact.
1	Staining or surficial oxidation. No pitting.
2	Moderate rusting. Rust flakes tight. Possible nodules. Minor pitting.
3	Fairly heavy rusting. Some scale. Nodules. Some pitting.
4	Heavy rusting. Rust scale easily removed. Deep pitting but metal is sound.
5	Heavy scale. Deep pitting. Unsound areas easily penetrated with pick end of geology hammer.
6	Small perforations in pipe.
7	Large perforations in pipe.
8	Invert gone from pipe.

These ratings attempt to reflect both scale and nodules, Wisconsin's two principal corrosion modes. They can be used as a gross estimate of remaining service life. For example, if a pipe has a C.R. of 4 and has been in service for 20 years, the rate of corrosion is 5 years per C.R.; with 2 C.R. ratings to perforation, the remaining service life would be estimated as 10 years.



## Calendar

### T.I.C. workshops

Details and locations for workshops are in the announcements mailed to all **Crossroads** recipients. For additional copies, or more information, call the T.I.C. at 800/442-4615.

**Winter Road Maintenance** Prepare for winter operations! This updated workshop covers the latest on ice control materials and operations planning. Share experiences and tips for better winter operations. Past participants report marked improvements in their operations based on this workshop.

Oct 14	Tomah	Oct 22	Green Bay
Oct 15	Eau Claire	Oct 23	Brookfield
Oct 16	Cable	Oct 24	Barneveld
Oct 17	Minocqua		

**Local Transportation Aids** In this ETN workshop you will learn about general transportation aids and local road improvement aid programs, including what funds are available, procedures, and requirements. This is part of a series on Local Transportation Issues. If you haven't received a brochure for the series call your local county Extension office or (608) 262-9660.

Oct 14 9:00 to 10:20, an ETN location in every county

**Setting Speed Limits** A review of why people drive as fast as they do and the effect of speed on safety. It will also cover local governments' authority to set speed limits and how to set ones that are safe, reasonable and enforceable. This is part of series on Local Transportation Issues. If you haven't received a brochure for the series call your local county Extension office or (608) 262-9660.

Nov. 4 9:00 to 10:20, an ETN location in every county

### UW-Madison seminars

Local government officials are eligible for a limited number of scholarships for the following courses in Madison. Use form on page 7, call 800/442-4615, or e-mail: [ranum@engr.wisc.edu](mailto:ranum@engr.wisc.edu).

**Managing Snow and Ice Control Operations**, Oct 6-7

**Timing Traffic Signals Using TEAPAC, PASSER, TRANSYT & NETSIM**, Oct 29-31

**Evaluating Pavements for Effective Rehabilitation**, Nov 3-5

**Neighborhood Design and Traffic Calming**, Nov 13-14

**Stream Stability and Scour for Bridge Inspectors**, Dec 8

**Bridge Inspection Update**, Dec 9-10

**Non-Destructive Evaluation of Bridge Conditions**, Dec 11-12

**Managing Urban Forestry Programs**, Dec 15-16

### Snow Plow Rodeo

There's still time to enroll your best plowing crew in the **Snow Plow Rodeo**, sponsored annually by the Wisconsin Chapter of the American Public Works Association. It's a great way to get your drivers ready for winter. Call Bill Kappel at 414/286-2369 or Mark Hochschild at 414/761-5376.

Wednesday, Oct 1, at the Waukesha County fairgrounds

## Reclaiming methods show varied

Last fall Dodge County tested ways of reclaiming asphalt pavement in demonstration sections on CTH V. They used four different reclaiming techniques for preparing the base, following all with a 2 1/2 inch hot-mix mat. All sections looked good this spring, reports Bob

Sindelar, Dodge Co. highway engineer. However, cores taken in July showed that an innovative asphalt foaming technique and a conventional milling and cold in-place recycling method both produced a strong base while pulverizing followed by a split lift compaction with no added asphalt produced a weaker one. The methods and their results are:

**Foamed asphalt injection** This method improves on a European technique and involves pulverizing existing asphalt pavement to full depth, reshaping and repulverizing the top four inches. It is simultaneously injected with hot liquid asphalt cement (AC 120-150) that has been expanded 8-10 times by spraying 1% to 1 1/2% water into it producing a foam. The coated aggregate is relaid and compacted by a grader fitted with a ski and automatic slope control. The aggregate remains workable for up to eight hours and when cured it appears much like standard asphalt.

This section produced strengths of 4000-4500 pounds at 72° F in modified Marshall stability tests made shortly after completion. Core results show the four inches of foamed pulverized pavement appear dense and well bonded. It cost about \$250 to pulverize, foam and shape 100 feet of two-lane pavement (one station), plus about \$200 for the AC.

**Emulsion asphalt injection** Existing asphalt is pulverized in place to full depth of the existing pavement. After reshaping, on a second pass, the material is injected to a four-inch depth with asphaltic emulsion (HFE-300) at 160° F, then shaped and compacted. The material sets up quickly, giving it shorter workability time. Modified Marshall density tests at 72° F showed this section at about 1800-2000 pounds. The five-inch emulsion-injected section of the core appears less dense with poorer bonding than the foamed asphalt core. Pulverizing, grading and injecting emulsion cost \$315 per station and the emulsion an additional \$190.

**Split lift compaction** This method pulverized the asphalt to full depth, 10-12 inches, then followed a new Wis-DOT requirement to compact the material in two lifts or layers with water added to each. The top level is graded to the side while the lower half is compacted. The loose material is then spread back on the road and compacted. The cost was \$315 per station. The top 1.7 inches of the core showed pulverized



## results



*Injecting foamed asphalt during pulverizing shows promise (far left).*

*Skis help keep grader level (left).*

pavement bonded to the new asphalt, the remaining eight inches were fine and gravelly with very little bonding.

**Milling and cold in-place recycling** This widely-used conventional milling and cold in-place recycling method involves milling asphalt to a maximum of six inches. The reclaimed asphalt is crushed to one inch, screened, and passed to a paver which relays it. No emulsion or rejuvenator is added. Moving the material may produce excess in windrows and the system can be difficult to balance. The cost was \$234 per station. In the core, the top three reclaimed inches looked very similar to the hot mix top. Beneath is 6.5 inches of fine, gravelly, pulverized pavement.

A researcher from Marquette University is evaluating the pavement quality produced by these methods. The goal is to produce high-quality finished roads at the most economical cost. The foaming technique may save money because its strong base permits a thinner overlay mat, cutting per mile costs and stretching the new hot-mix over more miles. It can also be used to build up the base for heavier traffic loads.



*Cores show different results from the four reclaiming methods.*

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for a new asphalt surface. Some contractors pulverize some of the base beneath the pavement along with the asphalt to achieve a uniform depth. Gravel may also be added over the pulverized material to increase the depth of the base. This process also works on roads with curb and gutter. Excess material can be windrowed or hauled away for recycling.

**Mill and relay** The milling machine removes some of the existing asphaltic surface, but may leave a portion of the asphalt pavement, or the underlying concrete pavement, in place. Milling reduces reflective cracking problems and can also be used to cut down excessively thick pavements. Milled material can be reshaped with a grader, but in milling the asphalt material is often picked up off the surface so it can receive other treatments: salvaging for recycling or later use, crushing to size, injection or spraying with new asphalt emulsion, delivery to a paving machine to be relaid, etc. Milling and relaying generally requires a bigger equipment train but uses more of the strength of the existing pavement.

**Mill/pulverize, add asphalt emulsion, and relay** Asphaltic pavement is broken up, crushed to a uniform size (smaller than 1½ inches, for example), and then uniformly sprayed or injected inside the machine with a specified asphalt emulsion. The material is then relaid on the road and compacted, producing a relatively stronger base that can carry higher traffic loads. Like the other techniques, this still requires a new asphalt surface.

**Mill/pulverize, add foamed asphalt, and relay** An experimental new technique involves injecting water along with hot asphalt emulsion to better coat the reclaimed asphalt. This technique also gives a strong pavement base. (See accompanying story.)

“Reclaiming is a huge tool and there’s lots of flexibility involved,” says Bill Kahl of WK Construction. “As many ways as you can think of, it’s been done. You have to be flexible to adapt to the problems you find in the field.”

## **Mill, sealcoat a temporary fix**

The Town of Carlton, near Kewaunee, is milling and sealcoating about five miles of asphalt pavement each year. The process improves broken asphalt surfaces by converting them into smoother riding sealcoated gravel roads. In a couple years, when all the worst roads have been milled, the town will begin to put hotmix overlays on them.

Milling to a depth of about 10 inches and adding gravel over the top produces a base of about 12 inches, according to Town Supervisor Ken Papham. Without sealcoating the cost is about \$14,000 a mile.

“It gives the roads a chance to settle down. If there are soft spots they show up and we know where to dig,” says Papham.

## With crash data, simple changes can aid safety

Sometimes relatively simple changes can make a big difference in safety. In Oshkosh, removing parking near congested intersections considerably reduced accidents.

By reviewing the number of traffic accidents with a simple spreadsheet program, Mark Huddleston, City of Oshkosh Transportation Director, was able to spot intersections with higher-than-normal accident rates. In eight years, they corrected 52 intersections, removed parking near most, and changed stop signs at a few. Accidents went from 230 per year before the change to 88 the year after.

"I look at the summary once a year," says Huddleston. "It takes about a day." A secretary records each accident by street name and type of traffic control. Huddleston uses the computer program to alphabetize the accident records, then summarize and rank them. "I generally look at bad intersections to see if I can determine the problem," Huddleston says. Oshkosh records about 1200 crashes a year.

"Most local enforcement agencies will keep a copy of each accident report and file it," says Dick Lange, WisDOT Central Office Traffic Engineer. "But it may be filed by date or party name, and that makes it difficult for local street or highway officials to look for hazardous locations." Lange was an instructor at a T.I.C. workshop on traffic safety. Although communities like Oshkosh record data themselves, all accidents are also kept on WisDOT computers. Reports for specific communities can be prepared, Lange says.

Attending the T.I.C. workshop was "a real eye-opener," says James Hahn, Public Works Administrator for the Village of Rothschild. "I attended with my police chief. He realized how important it is for his officers to use the same name for a particular street so it can be tied together accurately."

In Jefferson County they use a county-wide report and one for each township, says Jeff Haas, the county's highway commissioner. "The Traffic Safety Committee uses the data in evaluating requests to reduce speed limits," Haas says. "A separate report on accidents that involve animals helps me find areas that require additional deer crossing signs." Depending on traffic volume, signs are considered if there are three to five accidents in a couple years.

Accident data also helps in applying for safety improvement funding, says Pat Calabrese, Chippewa County Operations Superintendent. He used data from Lange's office as part of an application for a project in the Town of Lake Holcombe. "Town officials thought they had a problem at the bridge over Holcombe Flowage," Calabrese says. "It has poor approaches and we knew of one accident. The data gave us the crash history for the bridge." Whenever they develop improvement plans, the county looks at the crash history data for any particular areas needing attention.

*For crash data reports, contact your WisDOT District Office, or Dick Lange at 608/266-1620. For information on an accident reporting system like Oshkosh has, contact Mark Huddleston at 414/232-5341. Watch for flyers for the T.I.C.'s next Safety Workshop.*

## Resources

*A limited number of copies of the printed materials listed here are available from the Wisconsin T.I.C. unless otherwise noted. To get your copy call 800/442-4615 or use the form on page 7. Videotapes, CD-I discs and CD-I players are loaned free through Wisconsin County Extension Offices. If you do not have a video catalogue, you may request one at our 800 number.*

**NEW! Inspectors Job Guide and Highway Maintenance Tables** T.I.C., 34 pp. A handy, pocket-sized laminated guide full of valuable information for inspectors, supervisor, or anyone who has to plan, lay out, or inspect road and drainage projects. It covers the steps to follow when inspecting paving, walkways, base course, geotextiles, culvert pipe installation, sewer work, structures, grading, and seeding. Contains the important maintenance tables needed to figure quantities for road maintenance activities. Available in English or metric units. Order copies for each inspector, supervisor, and road crew leader.

**CD-I (Compact Disc Interactive) training** CD-I is an individualized training tool using a television, CD-I disc, and a special player (all now available from the T.I.C. library). Users respond to questions or situations presented by the disc. To organize individual training for your employees, all you need is the player and disc, a TV, and a quiet place for the training.

**NEW! Truck Driver Training Series (CD-I)** Seven modules designed for the truck driver. Each includes a CD-I disc and self teaching guidebook which present materials, equipment, and methods. Users can test themselves with the question-and-answer

format. Each module takes one to two hours depending on the subject and the user's experience and knowledge. Based on US-DOT guidelines, the training meets or exceeds DOT requirements in every subject area.

Pre-Trip Inspections #18043	Drug Alcohol Awareness #18047
Speed Management #18044	Hazardous Materials #18048
Backing and Turning #18045	Hours of Service #18049
Space Management #18046	

**Access, Location, & Design, Participant Notebook**, NHI Course No. 15255, 1993, 492 pp. Protect street capacity and reduce traffic conflicts by applying the principals, standards, and methods in this well-organized resource and design guide. Useful for state, county and city engineers, planners and consultants who design streets and commercial driveways, review development plans, and develop or administer street access policies and practices.

**Local Low Volume Roads and Streets**, US-DOT, Federal Highway Administration and American Society of Civil Engineers, November 1992, 138 pp. This reference manual contains a breadth of information related to the design, maintenance, and operation of low volume roads, which typically carry less than 500 vehicles per day. It includes discussions and references on planning, construction and maintenance, traffic and safety design, pavement management and rehabilitation, and geometric design considerations. It is written so as to be particularly useful to individuals with limited technical expertise and experience.

# Efficient utilization pays off

Every highway and streets operation must balance equipment, employees and productivity. An aggressive program of improving equipment utilization has made St. Croix County's balance very favorable. From 1987 to 1996 the amount of work produced went from \$80,000 per employee to over \$140,000 with the same number of employees.

"We started looking at how to better use each piece of equipment so it's not costing the taxpayers to have it here," says County Highway Commissioner Dan Fedderly. Each machine has certain minimum fixed costs (insurance and depreciation) and operating costs (gas, maintenance, etc.) "In round numbers, if it costs you \$10,000 a year for a truck and you only use the truck 100 hours, at a rental rate of \$50 per hour you've just lost \$5000," Fedderly explains.

First they analyzed the total revenues generated from each major "client"—county, state, and township—in terms of who paid what portion of the operating minimum for each piece of equipment. This analysis identified the county's workload and revenue sources. Next, they looked at the number of employees and the work each produced.

## Making equipment work

"Then we looked at: how do we do better? We increased the amount of work we did by trying to put the right pieces of equipment in the right places," Fedderly says. Twice a year county office manager Tim Ramburg reports to a committee on each piece of equipment. Some equipment needed for emergencies will never cover the minimums, but others, left behind by workload shifts, are disposed of.

The county's grader fleet is a good example. Historically they had an average of 15 graders. After looking at the hours on each unit and the needs, they decided to try to put more hours on fewer units. The fleet is now 6 main units.

Determining need was the first step. "Do we really have to have four graders in different places at the same time, or could the work be done by one unit within the same time period?" Fedderly asks. "The urgency is with snow plowing, so we put wings on the truck plows. That buys additional time for the grader fleet to get around." It was necessary to invest in better graders that could cover more ground faster.

## More revenue, lower costs

Increasing revenue also helps. As Fedderly notes: "You can only increase equipment utilization if you have the work." The county promoted services to townships: simple maintenance and plowing to complete design, engineering and reconstruction of roads. Revenues from townships doubled from \$1.5 million in 1987 to over \$3.5 million in 1996.

Containing costs is a must. Some equipment just doesn't perform. For example, a group of tri-axle trucks was continually in the red because of breakdowns, bad set-up, and changes in usage. Even though some of them may have been newer than other trucks in the fleet, the county began disposing of them. "We couldn't afford to keep them," Fedderly says. Similarly, once they set their effective fleet size (35 maintenance and 18 tri-axes), they began to turn over about five trucks a year. This ensures that, ideally, no truck in the fleet is older than 10 years old. Operating and repair costs are held down and units are on the road generating revenue.

"You have to manage each part of the equation: workload, employees, effectiveness, and equipment," says Fedderly. "Put them all together and that gives you the best utilization and productivity. Management is the key, and that comes down to individuals. Patrol Superintendent James Harer manages the day-to-day operation ensuring effective utilization, and Maintenance Superintendent Steve Schofield manages equipment purchase and monitors daily utilization. Every employee, working together with the Transportation Committee, ensures our operation's success."

# Reader Response



If you have a comment on a **Crossroads** story, a question about roadways or equipment, an item for the *Idea Exchange*, a request for workshop information or resources, or a name for our mailing list, fill in this form and mail *in an envelope* to:

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University of Wisconsin-Madison  
432 North Lake Street  
Madison, WI 53706

**Or call, fax, or e-mail us:**  
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# Training: it starts at the top

Training can have many benefits: to bring a new employee up to speed, or upgrade skills among existing employees; to learn techniques for meeting new standards, and bring in fresh ideas. Many managers rely on training as an important tool in their effort to improve efficiency.

However, training alone will not solve all problems. Personnel performance and motivation problems, for example, need individual counseling and performance reviews. You can't simply send a poor performer to training and expect something good to happen. Training won't make up for out-dated policies and procedures or for inadequate resources. Management must review the entire organization and identify what problems the agency faces and how to address them. Training is only one tool.

When training is chosen, management must have a clearly defined reason for it, clear expectations of the employees who participate, and a followup strategy. In other words, effective training starts at the top.

## Training is an investment

Expect your investment in training to pay dividends. Carefully select employees to receive training. Make sure they understand why they are going and their responsibility to learn the information and implement it afterwards.

Be positive. Let employees know that being sent to a workshop shows management's confidence in their abilities

and value. Sometimes they are made to feel it is punishment for not knowing the job. At T.I.C. workshops occasionally people come with no idea why they were sent or what the course is about. They usually have a negative outlook that is not conducive to learning or making improvements.

Managers should debrief the persons who were trained when they return and involve them in any changes that the training produces. This means management has to be prepared to make improvements suggested by employees as a result of the training.

## Be prepared for change


Nothing is more discouraging to an employee than seeing management ignore or not take seriously their suggestions for improvements. While some suggestions may not work for your agency, management needs to develop an attitude and an environment receptive to change. This encourages employees to benefit from training and motivates them to be on the lookout for ways to improve your operations.

Implementing improvements can be a challenge. Sometimes it takes a few tries and some mistakes. Anticipate this and accept it as the price of getting better. If management is extremely negative when the first difficulty arises, it will discourage any future interest in improvement.

If you choose appropriate training and provide a workplace where employees can take part in implementing improvements, you'll have motivated employees, and that's the key to a successful operation. It starts at the top.

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