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Pavement Management, Timely Maintenance Keep Orlando-Area Roads Among Nation's Best

In Spring 2002 Orlando and Orange County, Fla., drivers were able to congratulate themselves on having the third best road conditions of all urbanized areas in the United States.

Orlando and Orange County civil engineers credited meticulous pavement preservation techniques – and pavement management – with the superior showing.

Orlando/Orange County drivers also could enjoy the fact that extra vehicle operating costs per driver in their area due to pavement-related wear-and-tear amounted to $74 per vehicle, compared to a national average of $358, and a worst-case extra VOC of $513 in Boston.

Federal Highway Administration (FHWA) pavement condition data in Orlando's urbanized area for the year 2000 – the most current year for which reliable information is available – indicate that 80 percent of Orlando/Orange County arterial roads were rated "good", with only 4 percent rated "poor". Another 10 percent were rated "fair" or "mediocre".

Atlanta and Jacksonville were rated ahead of Orlando in FHWA's statistics, which were analyzed and released as a special report by TRIP, The Road Information Program, in March (see related sidebar). Orlando was followed by West Palm Beach. But not all of the top five areas were in the Sunbelt, relatively free of damaging ice and snow; Minneapolis-St. Paul was ranked fifth best.

"Perfection would be 100 percent good, and poor zero," said Richard M. Howard, P.E., city engineer, Orlando Engineering/Streets & Drainage Bureaus. "We're not quite there yet."

Nearly all asphalt streets

Nearly all of the City of Orlando's streets are asphalt-surfaced, and the city attempts to apply rejuvenating treatment to every asphalt surface after six years, followed by an asphalt overlay or hot in-place recycling (HIR) every 11 or 12 years on the average, Howard said.

While not included in the FHWA statistics, residential streets receive timely maintenance as well, Howard said. "Typically a residential street will receive a periodic inch asphalt overlay or a microsurfacing," he said.

The Foundation for Pavement Preservation (FP2) defines microsurfacing as a mixture of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed, and spread on a paved surface.

"Larger volume streets receive hot in-place recycling or overlay, depending on the structural condition," Howard said.

What street gets what treatment, and when, depends on the engineering staff's experience, combined with the city's pavement management system (PMS), Howard said.

"It's a very systematic approach, based on our PMS which was instituted in 1985," he said. "We hired a consultant to do a pavement inventory, measuring length and width of the streets. Then we did a block-by-block condition assessment and inserted the information into our PMS, with deduct values for certain pavement distress levels."

In Orlando, independent unit preheats pavement ahead of main Repaver.

The initial assessment was that network-wide pavement conditions were good. "They weren't as good as they are now," Howard said. "We've put a lot of effort into increasing the budget, making sure we're doing maintenance, overlays and any kind of rehab work at the right time."

Remarkably, this general improvement has taken place against the context of enormous growth in the Orlando area. Metro population grew by 34 percent in the 1990s alone, to 1.6 million.

"Our network has increased because we've annexed portions outside the city," Howard said. "What it's shown us is that some of the things we've been doing right we have continued; we've put a lot of money into overlays. And some of the newer techniques that have come along after 1985 we've adopted as we've seen the need, like hot in-place recycling."

Now, the PMS provides a blueprint for future budgeting and pavement preservation work. "It shows us where we need to put our money, and justifies increases in budget, which is one of the main benefits," Howard said.

This is critical when it comes time to defend budgets before the mayor and city council. "You can prove how much you need to maintain your system," he said. "Before it was a guess, based on how much you were able to talk the budget director out of. But now we can justify our expenditures."

County adopting PMS

While Orlando has had the benefit of a PMS since the 1980s, Orange County is in the process of developing its system.

"We don't have a pavement management system per se, but we do have an inventory and good recordkeeping," said Deodat Budhu, P.E., manager, Roads and Drainage Division, Orange County, Fla. "We are making sure we apply maintenance in a preventive form before pavements suffer any structural degradation."

In the past the county was funding $4 million to $5 million per year on road maintenance, Budhu said. "But over the past few years we've done an economic analysis and we're now spending over $12 million per year in maintaining our arterials and collectors, as well as subdivision streets," he said. "We're investing more money in preventive maintenance, instead of reactive maintenance."

What the county lacks, though, is a PMS that will give it leverage in getting funds to plan future maintenance. "A PMS will give us the leverage we need to plan proactively," he said. "We need a better program that will allow us to plan our budgets."

It also will allow the county to respond to citizens who ask why the county is working on some roads, but not theirs. "A pavement management system will remove that subjectivity," Budhu said. "We will be doing exactly what the science is telling us. As we get more funding, there will be more demands, and we want to make sure that citizens understand that maintenance is being undertaken on a scientific basis."

"We've got everything from four-lane to six-lane arterials, all the way down to cul-de-sacs in subdivisions," said Carl Landon, highway coordinator, Roads and Drainage Division, Orange County, Fla. Currently the county has 2,538 centerline miles to maintain, of which one-quarter is arterial. And that total may rise if the state is successful in turning over 442 additional miles of arterials to the county.

"Orange County probably has been the most aggressive of those I've seen in trying new strategies to maintain its pavements," said Howard F. Russell, P.E., chief engineer, Roads and Drainage Division, Orange County, Fla. "We're on a quest to find the most cost-effective means of preserving pavements. As fast as we're building around here, we need faster ways and cheaper ways to maintain pavements while incorporating recycling."

Recycling benefits city, county

To keep their pavements smooth and trouble-free, both Orlando and Orange County use a distinctive, one-pass hot in-place recycling (HIR) process that reuses the existing deteriorated asphalt as a leveling course, and on it places a fresh layer of virgin hot mix asphalt (HMA).

While there are reasons Orlando will use microsurfacing or rejuvenating agents on particular pavements, city engineer Howard said overlays and hot in-place recycling have their unique benefits to residents.

"I don't hear complaints when we hot in-place recycle," he said. "It really makes a nice, finished product. We don't have to make excuses. It looks good when it's done, and we get the benefit of reusing asphalt so there's more structural improvement there than with just an overlay. We're not significantly changing drainage patterns."

Main Repaver unit heats asphalt to 300 deg F, scarifies to a depth of 1 inch and mixes scarified material with rejuvenator; then reapplies reclaimed asphalt pavement and places additional lift of virgin mix on top.

Howard added the HIR recycled pavements are standing up to the strong central Florida sun, crushing traffic loads and even heavy tour buses going to and from the fabulous attractions and theme parks to the south of town. "We've been doing HIR for years and have not seen any significant deterioration," he said. "No rutting, no cracking beyond what might be expected with normal oxidation."

The HIR process used by Orlando and Orange County from Cutler Repaving, Inc., Lawrence, Kan., heats the existing pavement to 300 deg F. When in a resulting, softened, pliant condition, the pavement is scarified to a depth of 1 inch and a recycling agent that restores the viscosity of the aged asphalt is mixed into the scarified, reclaimed asphalt. This material is then reapplied and distributed with a screed as a 1-inch leveling course.

While that material remains at a minimum 225 deg F, a virgin hot mix asphalt overlay is placed over the recycled leveling course. Cutler's unique machine scarifies, applies recycling agent, places the leveling course, and applies the new overlay simultaneously in one pass.

That benefits road users because there is no delay between the time the pavement is recycled and the time a riding or friction course is placed, resulting in a safer work zone for road users and for contractor personnel.

Also, because the hot virgin mix is placed over the heated, recycled leveling course, the process achieves a thermal bond between the recycled layer and the new layer.

"From an engineering point of view, there is no delamination between the recycled layer and the new overlay," said Cutler vice president John Rathbun. "That's very important in predicting life cycle performance. The same heat that's used to take the road apart is used to put it back together, and the two layers are effectively compacted into one lift."

The process also reheats the edge of adjacent repaved lanes, resulting in a more durable, higher-density seam between the driving lanes, Rathbun said. The entire machine moves forward at a rate of 18 to 25 feet per minute.

The virgin surface is applied by a four-section vibratory screed no more than 3.0 feet behind the leveling course screed. It's fed from a hopper at the front of the Repaver via a drag/slat conveyor chain which brings the HMA through a tunnel along the length of the machine, to the paving screed. The result is a monolithic, 2-inch, finished pavement that is equivalent in ride to a 2-inch mill and overlay.

The complete pass takes place in minutes, meaning traffic barricades can come down quickly, with all reclaimed material used on the spot without hauling, so user delays are kept at a minimum compared to conventional mill-and-fill recycling projects.

Traffic can drive on the new pavement as quickly as with conventional paving, while driveways and intersections are blocked for about 15 minutes. And the objectionable tack coat ahead of HMA paving is eliminated, meaning Orlando and Orange County enjoy cleaner sidewalks, curb cuts and automobiles.

"The process can be invasive, because people are not used to seeing the machine coming down the road," Howard said. "But the entire method is accomplished at one time, and then they're gone. So it's very appropriate for urban areas."

Worst, Best Road Conditions Get National, Local Attention

The worst – and the best – condition metropolitan road systems in the country got national and local media attention this spring when TRIP, The Road Information Program, issued a report ranking metro areas according to the condition of their roads.

The best condition road systems were found, in descending order, in Atlanta, Jacksonville, Orlando, West Palm Beach-Boca Raton, and Minneapolis-St. Paul.

But Boston, New Orleans, Los Angeles, Detroit, New York City, San Jose, San Francisco-0akland, Oklahoma City, Sacramento and Grand Rapids had the highest percent of roads in poor condition, with Boston ranked "worst".

Using Federal Highway Administration data, TRIP ranked cities in the nation's largest urban areas with a population of 1 million or more. In addition, the report includes data for cities with more than 200,000 people. The full report and data is available at www.tripnet.org.

TRIP is a nonprofit transportation research group which identifies surface transportation needs. In its March 2002 analysis, TRIP found that nearly one-fourth – 23 percent – of major roads in the nation's largest urban areas have significant deterioration and need immediate repair or reconstruction.

Another 27 percent of the nation's urban roads are rated in mediocre condition and currently or soon will be in need of repairs to return them to good condition.

Rough Ride in the City: How Poor Road Conditions Increase Motorists' Costs, also concluded that motorists in the nation's major cities are paying an average of $358 per motorist in extra vehicle operating costs (VOC) to drive on roads in need of repair.

"Motorists in our nation's largest cities are in for a rough ride every time they drive unless needed road improvements are made," said Will Wilkins, TRIP executive director. "Motorists are paying hidden taxes as a result of extra vehicle operating costs resulting from additional tire wear, extra fuel consumption and vehicle deterioration caused by driving on roads in need of repair."

Suited for Orange County arterials

The HIR process is particularly suited for certain high-profile arterial projects which Orange County has faced.

"On International Drive – in the heart of the convention center and tourist entertainment district – they wouldn't let us mill-and-fill because it was too dusty, with the ongoing PGA convention and too many tourists traveling through," Orange County's Landon said. "We had to come up with something else, and that's when we brought the Cutler HIR process in."

As a result of that high-profile project, the county gained confidence in the HIR method.

"International Drive is in excellent condition after seven years," Landon said. "HIR is quicker, suppresses reflective cracking and eliminates dust in construction. Lane closures are minimized, and because its a rolling procedure, no one lane is closed for a long period. And less material and trucks come out and go in so there is less traffic disruption."

In fact, Orange County has steadily increased its utilization of HIR since International Drive. "We use it mainly for our heavily traveled arterials," Landon said. "We look for pavements that are raveled or have slippage. We don't use it on pavements with heavy alligator cracking because that indicates big base problems. If a pavement is due for an overlay, and we don't want to increase its elevation, it's a candidate for HIR."

Reusing what's there

Besides its engineering characteristics, the concept of HIR appeals to Orlando's Howard in a more thoughtful way. "At the city we try to reuse what's there," he said. "We want to extend the life of the structure we have, rather than create a new one. There is a lot of value there, and Repaving is a major component in making the most efficient expenditure of our budget."

"Orlando has a strategic approach with its pavement management system to get to where its system needs to be," Cutler's Rathbun said. "That says something not only about the governing body, but their approach as well. Preserving the structure is what it's all about."

"In the past, if we had to resurface a road, we had to rip up the surface, haul it away, come back in and place a new surface," Orange County's Budhu said. "Now we have a way to recycle the pavement, providing a better base, with fresh asphalt on top. It is a one-pass mechanism which helps us with traffic control. It's a cost saving for us, and that helps us do much more work with that money." ■

More information about Orlando is available at:
http://www.cityoforlando.net

About Orange County at:
http://www.ocfl.net

About FP2 at:
http://fp2.org

About Cutler Repaving, Inc. at:
http://www.cutlerrepaving.com.

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