

# **UHP/LV Waterjet Surface Re-texturizing for Bitumen Flushing / Bleeding**

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# About Steve / Devco..

- Background in applied mechanics
- 16 years experience with UHP systems
- Inventor and lead architect UHP/LV
- Problem solver - and a 'kiwi' !

Aquamax Devco is located @ the Wellington  
Institute of Technology



# So what is UHP/LV?..

- UHP/LV = Ultra High Pressure/Low Volume waterjet.
- Derivative of core technology from Flow International Corporation, originators & global patent holders of UHP.
- Underlying premise is to convert *ultra-high water pressure* (>40,000 psi) into *ultra high velocity* (> Mach 2) for the purpose of cleaning or preparing a given surface.



# Key benefits of UHP/LV?..

- Around 90% less water than HP alternatives, with at least the same surface result.
- Reduced volumes mean significantly lower mass, so physics of high velocity (as opposed to high volume) becomes predominant characteristic.
- High precision milling cutting action (vs water stream erosion) = minimal residual surface damage.
- Much lower back thrust reaction so pumps and equipment can be more compact, more lightweight and more portable.
- Low volume equates to minimal material waste recovery processing requirements.
- Environmentally friendly – no chemicals, less waste.



# A platform technology..



# What is flushing (aka bleeding)?..

“Flushing is a film of bituminous material on the pavement surface which creates a shiny, reflecting surface that usually becomes quite sticky when hot. Flushing is the result of free asphalt migrating upward to the pavement surface. It occurs most often in the wheel-paths, especially during hot weather. Since the flushing process is not reversible during colder weather, asphalt will accumulate on the surface. Flushing results in low frictional characteristics when the pavement is wet and is, therefore, a safety hazard.”

*3M Road Surface Guide - Flushing Definition*



# Growing problem in the US?..

State	Approx. Total System Lane Miles	Approx. Chip Seal Lane Miles	% of Chip Seal Lane Miles with Bleeding
Texas	194,460	147,700	30%
North Carolina	170,128	51,300	14%
Virginia	125,365	40,000	5%

**Table 1. PMS Chip Seal Data provided by state agency Pavement Engineers**

“..growing recognition that chip seals are among the most cost-effective preservation treatments for extending the life of all flexible pavement types. Chip seals, however, are susceptible to two modes of failure, raveling and bleeding..”

*MR1 Engineering Design Review, Steve Varnedoe, Former Assoc Director, NCPP*



# MR1 prototype – lab on wheels..



Linear rail & carriage



Interactive recovery shroud



Hydraulic controller



A) Atmospheric valve B) Accumulator  
C) Regenerative blower



Interceptor

- Mobile Pavement Preservation Unit
- Has NZ Govt backing
- Specifically addresses flushing in chip seal-based bitumen aggregates
- Multi-purpose capability with small footprint and ideal for use in compact urban areas
- High degree of automation including intelligent sensors and data capture
- Treats even very hot bitumen without surface damage
- On board recovery & waste removal system





# Trial results are promising..



Figure 2. Before treatment



Figure 3. After treatment.

Table 3. Wise Street, Skid Resistance

Test Location	Position	BPN Before	BPN After
1	Outer wheel path	54	85
2	Between	84	84
3	Inner wheel path	49	86
4	Outer wheel path	54	81
5	Between	72	86
6	Inner wheel path	49	80

*MR1 Engineering Design Review, Steve Varnedoe, Former Assoc Director, NCPP*



# It's about pavement preservation..

Pavement Preservation Guidelines					
	Type of Activity	Increase Capacity	Increase Strength	Reduce Aging	Restore Serviceability
		New Construction	X	X	X
Reconstruction	X	X	X	X	
Major (Heavy) Rehabilitation		X	X	X	
Structural Overlay		X	X	X	
<b>Pavement Preservation</b>	Minor (Light) Rehabilitation			X	X
	Preventive Maintenance			X	X
	Routine Maintenance				X
	Corrective (Reactive) Maintenance				X
	Catastrophic Maintenance				X

“Preventative maintenance is a planned strategy of cost effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition..”

*US DoT / FHA Memo from David R. Geiger, Director Asset Management*



# Towards a new economic model..

Old way ROI (“big iron” approach)

✗ How many lane miles per day?

New way ROI (MR1 equivalent approach)

- ✓ Lower capital costs due to small footprint, modular design and off-the-shelf proprietary components.
- ✓ Lower running costs due to less fuel/energy, fewer returns-to-base, reduced manpower, minimal water use, materials recovery/recycling.
- ✓ Improved asset utilization due to multi-purpose capability and urban maneuverability.
- ✓ Increased safety and reduced litigation risk due to better BPN.
- ✓ Proactively preserve state road assets, retard future deterioration, and maintain or improve the functional condition – i.e. pavement preservation aims.



# To Summarize...

- 90% Less Water Usage
- Environmentally Friendly
- Low Volume – Key Characteristic
- Milling Cutting Action vs. Water Stream Erosion
- Equipment ‘Lightweight’ and Portable
- Low Waste Recovery Processing Requirements



# Thank you and go well !

To explore how UHP/LV could assist with your pavement preservation needs, please contact:

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