

Sealzall Machine - Automated High Production Longitudinal and Manual In-Lane Crack Sealing

Outcome — A field deployable crack sealing machine capable of high production automated longitudinal sealing and manual in-lane crack sealing operations.

Benefit — Increases both the cost effectiveness and safety of highway pavement sealing operations.

AHMCT researchers are developing the Sealzall machine to replace the prototype Transfer Tank Longitudinal Sealer (TTLS) which completed highway testing Spring 2006 (Fig. 1). Highway test results indicated that the TTLS application truck lacked sufficient sealant melting capacity to be effectively deployed. Replacement of the 400-gallon on-board sealant kettle alone would have mitigated the sealant capacity issue, but Caltrans Maintenance requested that manual sealing capabilities also be included in the upgrade project to eliminate the longitudinal only limitation of the TTLS concept. Since the upgraded TTLS machine would now be upgraded to seal all types of pavement cracks, the equipment name was changed to the Sealzall machine. In practice, since the longitudinal sealing operation moves continuously and the in-lane sealing are a stop and go operation, ideally the two operations would be conducted at separate times to realize maximum benefit. The existing TTLS transfer trailer will still be utilized to resupply the Sealzall application truck kettle with large amounts of hot sealant as a method of further increasing highway seal production rates.

Longitudinal Sealing Operations

The Sealzall design continues to provide all the field proven advantages of automated longitudinal crack sealing (ALCS), using polymer modified hot applied sealants. ALCS machines are ideally suited to seal joint cracks between PCC slabs as well as transitions between PCC slabs and AC shoulders. These types of cracks allow for sealing at a continuous speed up to 5 mph which contributes to the resulting high production rates consistently achieved by this operation. Since longitudinal cracks typically represent the largest share of highway cracks sealed, high production longitudinal sealing can play a significant role in reducing the miles of open pavement cracks which leads to premature pavement deterioration. The advantages of using the Sealzall over the standard hand operation become even more realizable when the operation is conducted without establishing a fixed lane closure. The TTLS design was specifically designed to remove all workers from direct traffic exposure by providing complete control over the longitudinal sealing operation from inside the truck cab. In-cab operation allows crews to capitalize on the many advantages associated with operation within moving lane closures.

In-lane Manual Sealing Operations

A 20 foot heated hose and wand assembly has been added to the front of the Sealzall truck to support

manual in-lane sealing operations. Conversion between the longitudinal and manual configurations will be trivial. Conducting in-lane manual sealing operations with the Sealzall machine provides a greater degree of worker safety compared to the current manual operation. The Sealzall truck backs in the lane closure providing the highway-based crew with additional protection from traffic. Backing also provides the driver/operator a direct view of the crew on foot and allows a supporting attenuator truck to maintain the optimum separation distance from the operation, since it now is moving in a direction away from the fresh sealant and not directly over it as in the typical manual operation.



Figure 1 – TTLS Sealant Application Truck



Figure 2 – TTLS Sealant Transfer Tank Trailer

TTLS Transfer Tank Trailer

High production crack sealing requires an equal ability to produce hot sealant at high production rates. The TTLS was designed to test an innovative new hot sealant transfer approach that could potentially provide a virtually continuous hot sealant supply for application. Past ALCS machines were hampered by their ability to melt blocks of sealant on the highway limiting production rates. The 600-gallon sealant transfer tank trailer (Fig. 2), was designed to function as a hot sealant resupply reservoir for the sealant application truck. Sealant is brought out on the highway hot and ready to be applied. A flexible large diameter oil heated transfer hose provides the means to quickly transfer hot sealant to the truck tank. The capacity of the trailer tank was purposely chosen to be far greater than the truck tank, so the remaining hot sealant could accelerate the trailer kettle recovery time. Ideally the transfer trailer could make multiple transfers per day.

Crack Cleaning

Caltrans Maintenance also requested the incorporation of on-board crack preparation tools. Therefore, a high capacity rotary screw air compressor was installed on the Sealzall machine. For longitudinal operations, a jet of compressed air from a fixed nozzle will precede the sealing shoe to remove dust and dirt from the crack. For in-lane sealing, a compressed air hose connection is available on the front bumper adjacent to the sealant hose so standard manual cleaning can be conducted.

LCSM Cost & Safety Benefit

The Longitudinal Crack Sealing Machine was one of the first ALCS machines deployed to Caltrans Maintenance crews and was utilized extensively on the highway. The District 11, Chula Vista Travelway Crew has reported the following cost data comparing use of the LCSM vs. Hand Applied Operation.

Distance Compared: 32 miles along Interstate-5

	LCSM	Hand Applied
Number of employees	3	4
Average miles per day	3.5	0.8
Work days	9	40
Bare rate cost	\$4,017	\$23,820
Closures	NO	YES
Employees on foot	NO	YES

Figure 4 – Cost Comparison Data 10/02/03

- LCSM - In 17 days, 62 miles of AC/PCC joint line was sealed on Routes 5, 52, and 125.
- Hand Applied Method - The same amount of miles sealed would have required 77.5 days, 78 lane closures, and 465 hours of exposure of employees on foot to traffic.

Injuries possibly avoided by using the LCSM:

- There have been a total of 76 injuries in the last 10 years associated with rubber crack sealing.
- 27 employee injuries resulted from applying rubberized product on foot.
- 12 employee injuries resulted from loading material.
- 39 employee injuries reported that were not related to just rubberized crack sealing.

Current Status

The Sealzall project is in progress to upgrade the TTLS truck with a replacement sealant melting kettle and add the in-lane manual sealing capabilities. Sealzall is expected to begin field testing in Spring 2008.

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