High Production Longitudinal Crack Sealing

Output — Deploy new high production longitudinal crack sealer.

Benefit — Automate the sealing of longitudinal highway cracks with hot applied sealants. This will dramatically improve public mobility and maintenance safety and productivity.

The Transfer Tank Longitudinal Sealer (TTLS)

The Transfer Tank Longitudinal Sealer (TTLS) is the latest development in AHMCT's line of high production, cost effective, longitudinal crack sealing machines (LCSM). AHMCT researchers have developed this prototype system to further enhance the capabilities of the highly successful LCSM program. This program focuses on the development and field deployment of automated longitudinal pavement crack sealing equipment to Caltrans, using polymer modified hot applied sealants.

LCSM's are ideally suited to seal joint cracks between PCC slabs as well as transitions between PCC slabs and AC shoulders. LCSM equipment will not seal all the cracks on a roadway, but it will seal all types of longitudinal cracks at a continuous speed up to 5 mph. 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 LCSM over the standard hand operation become even more remarkable when the operation is conducted without establishing a fixed lane closure. The TTLS design was specifically tailored to capitalize on the advantage of operation within moving lane closures. The TTLS was also designed to test an innovative new approach that could potentially provide a virtually continuous hot sealant supply.

The TTLS Concept

The TTLS is based on the concept of decoupling the task of melting large quantities of sealant from the highway seal application operation. These tasks have conflicting requirements and only through separation, can both systems be designed for maximum performance. Therefore the TTLS system actually consists of two separate independent machines that are only connected briefly to transfer sealant. The TTLS consists of a seal application truck and a sealant supply transfer trailer. One feature that both systems have in common is a smart user interface, which improves operator control and system self diagnostics while reducing operator training requirements.

Figure 1 – TTLS Sealant Application Truck

TTLS Application Truck

The seal application truck (shown in Fig. 1), is the only part of the TTLS system that actually seals longitudinal cracks on the highway. Sealing can be conducted off either side of the truck and the entire operation of the machine can be monitored and controlled from inside the high visibility cab. This eliminates the need for any direct worker exposure to traffic and enhances continuous nature of the moving lane closure operation. The truck carries a 400 gallon propane fired oil jacketed sealant melter kettle which supplies material to the application shoe through a heated line and a variable speed sealant pump. An accurate material level is obtained from load sensing tank mountings.

Figure 2 – TTLS Sealant Transfer Tank Trailer

TTLS Transfer Tank Trailer

High production crack sealing requires an equal ability to produce hot sealant at a high production rate. The sealant transfer tank trailer (shown in Fig. 2), was designed to function as hot sealant resupply reservoir for the seal application truck. The transfer trailer is oil jacketed, propane fired and has a 600 gallon capacity. The transfer tank also has a load sensing trailer mounting to provide for an accurate material level. 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 recovery time. Ideally the transfer tank would recover in time to repeat the process as necessary.

TTLS Sealant Transfer

The TTLS transfer system (shown in Fig. 3), was designed to quickly transfer 400 gallons of very hot sealant. To avoid potential dangers a redundant safety system was incorporated into the transfer controller. It senses the transfer hose connection and will stop any sealant flow should the connection become unlocked. This prevents the possibility of leakage. The transfer controller also monitors both tank levels during sealant transfer to mitigate the potential of overfilling the smaller truck tank.

LCSM Cost and Safety Benefit

The District 11, Chula Vista Travelway Crew has reported some cost data when using 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.

Figure 3 – High Speed Sealant Transfer

Current Status

The TTLS prototype system is operational. The initial development and field testing is complete. Problems encountered with the application truck kettle heat-up time is preventing field deployment. Work continues to replace kettle.

For Additional Information

Arvern Lofton — (916) 324-2295, arvern_lofton@dot.ca.gov
Steve Velinsky — (530) 752-4166, savelinsky@ucdavis.edu
Duane Bennett — (530) 754-7401, dabennett@ucdavis.edu

Visit us at http://www.ahmct.ucdavis.edu.