

EUROPEAN EQUIPMENT RESEARCH

Brian E. Cox, *Strategic Highway Research Program*

INTRODUCTION

This paper is based upon a survey of innovative equipment for road construction and maintenance recently completed by the Transport Research Laboratory for the United Kingdom Department of Transport. At the time this paper was written, the analysis of survey results was not complete and thus this paper is based upon the preliminary findings.

The final survey results will be published in a six volume report, but in the meantime it is hoped that the following excerpted descriptions of equipment, related to their road maintenance and construction applications, will be of interest.

CHIP SEAL

More attention is being paid to design details, in particular to binder spray mechanisms. In addition, greater use is being made of computer controlled systems for rate of spread, temperature and pressure control. Chipping spreader developments are concentrating on application rate and the use of variable width spreader heads. For rolling chippings, vibratory rollers are gaining greater prominence and are considered to improve the orientation of the chippings in the binder film. Innovative machines designed to apply chip seals in one operation are considered the way forward. In France, where the treatment is used extensively, several prototype machines have been commissioned. One such machine, 16.5m (approx 54 ft.) in length and weighing over 40 metric tons (greater than 44 U.S. tons), has been designed to improve the placement of chip seals by allowing simultaneous spreading of the binder and the application of pre-dried chippings. Trials with this machine commenced February 1991 and observations have led to further refinements to improve performance. To date, more than one million square meters (greater than 1,200,000 sq. yds.) have been successfully applied in France with this machine.

A U.K. firm previously developed and marketed polymer modified binders for road construction and maintenance, is now marketing a surface treatment process. The equipment for applying the binder comprises a tanker of 19,000 liter capacity (5,020 gal.), with two computer controlled telescopic spraybars that give accurate distribution over widths of 0.3 to 6.0 m (1 to 19.7 ft.). However chippings are applied by self pro-

pelled chipping spreaders in a conventional way and rolled with a vibratory rubber-tired roller. Suction sweepers complete the process.

RESURFACING

What is claimed to be the first 'all-in-one' road resurfacing machine has been developed in France and is said to be ideal for smaller resurfacing and remedial road repairs. It dispenses hot asphalt binder by computer control from a 3,500 liter (925 gal.) heated tank. After application of the binder, aggregate is spread onto the road from the same vehicle using a small hydraulic crane incorporated into the bodywork of the vehicle. Material is transferred into a seven cubic meter (8.4 sq. yds.) tipping body with chip-spreading gate. Beneath the rear of the truck, a rubber-tired roller/compactor completes the process, which requires only two operators.

A computerized paving system, claimed to save material, increase machine life and ensure constant levels, has been developed by a Swedish company. The prototype comprises an on-board computer working with a laser receiver mounted on top of the machine. A transmitter at a fixed height sends a signal to the paver. This enables the computer to determine its own height and thereby regulate the thickness of bituminous material being laid. Its advantage over similar computer-controlled systems is its ability to optimize performance while maintaining the asphalt mixture layer thickness, particularly when negotiating changes in grade. The system also enables automatic logging of material usage, temperatures and laying times.

It is understood that the concept of using one machine to spread binder and the mixture has also been applied to other forms of surface treatments, such as polymer modified thin overlays.

CRACK FILLERS AND PATCHERS

The TRL report indicates that most of the innovations have originated from the United States and Canada. This may be due to differences in maintenance practices.

Personal observation indicates that preventive maintenance treatments, notably chipseals, are used much more extensively in Europe than in the United States. However, an innovative approach developed in France is an integral patching machine. This applies binder and chippings simultaneously and has rubber-tired wheels to provide initial rolling compaction. It is reported that around 200 of these machines are in use in France.

BITUMINOUS BATCH PLANT

A German company has produced a small mobile batching plant that can provide small quantities of bituminous material. Various mixes can be produced in successive batches. This gives the advantage of a high quality product at the right temperature in the correct quantity and is useful for small-scale applications.

COMBINED PAVING-COMPACTION MACHINE

A German company has developed a range of combined paving-compaction machines capable of laying and compacting bituminous material up to 300mm (11.8 in.) thick in a single lift. This is achieved using a newly developed high-power compaction system to provide a two-part screen comprising a conventional tamper and vibratory smoothing screen. The vibratory screen is a novel unit for high-power compaction, consisting of two pressure bars and an additional vibratory screen. It is claimed that the machine produces a good density and uniform compaction with optimum surface evenness for both thin and thick courses, including the use of stiff, deformation-resistant materials. Pre-compaction and final compaction are carried out simultaneously and the comparatively high temperatures required for such material facilitate these processes. It is claimed that the

paving season may therefore be extended, even for rapidly cooling thin surfaces. The new system has been subjected to numerous trials both in Germany and elsewhere with some success.

It may be that the adoption of the SHRP Asphalt Mixture specification and the possible adoption of Stone Mastic Asphalt (SMA) may create a need for improved paving equipment in the United States.

CONCLUSION

Innovative equipment development in Europe would appear to be primarily directed at preventive maintenance and rehabilitation. This is doubtless due to the differences in practice between the United States and Europe. In Europe, preventive maintenance treatments, notably chip-seals, are not only used extensively, but are designed. The design procedure will typically consider traffic weight and volume, road surface hardness, skid resistance requirements, weather conditions, aggregate type and size, binder type and the rate of spread of binder and chippings. The refinement of design procedures has created a demand for equipment that can precisely deliver and vary the delivery of binder and chippings across the width of application.

Similarly, developments in surfacing material, such as SMA and other comparatively thin wearing courses has spurred a demand for improvements in paving equipment.