The Canadian Engineer

A weekly paper for Canadian civil engineers and contractors

THE FLUXING OF ASPHALTS

DISCUSSION BY ONE OF THE WORLD'S LEADING ASPHALT AUTHORITIES, WRITTEN AT THE SPECIAL REQUEST OF THE CANADIAN ENGINEER, ON THE VARIOUS METHODS OF FLUXING ASPHALT AND THEIR RELATIVE MERITS.

By **FRANCIS PITT SMITH, Ph.B., M.Am.Soc.C.E., M.A.I.C.E.,**
Of Dow & Smith, Consulting Chemical and Paving Engineers, New York City.

IN the early days of the asphalt paving industry, only those asphalts were employed which were found in a hard state in nature. In order to make them available for use it was necessary to soften them, and for this purpose a heavy petroleum oil was used. A light oil would have been dangerous, owing to the giving off of inflammable vapors when heated to approximately 300° F. in the asphalt cement kettles; and, owing to the comparatively rapid loss by volatilization of its lighter constituents, asphalt cements made with light oils would have hardened quickly to an undesirable extent when exposed to atmospheric action in a pavement.

During the period referred to, the bulk of the petroleum refined in the United States was what is known as paraffine base oil; *i.e.*, petroleum in which the paraffine series of hydrocarbons predominated. It was therefore natural that paraffine residuums, as they were termed, should have been used for fluxing purposes. These residuums were obtained by subjecting the crude petroleum to distillation whereby the lighter oils, such as naphthas, kerosenes and light lubricating oils, were removed. What was left in the still was termed a residuum and was largely a waste product, and this was used as a flux. Such residuums were naturally very variable in composition and gravity. Although all of them were made from paraffine base petroleums, the process of distillation varied with the ideas and requirements of the different refiners, and some of them were badly overheated and partially decomposed or "cracked" during the distillation process. Their gravities varied from 21 to 28° Be., and their flash points varied from 175° to 450° F.

As the technology of the paving industry developed, it was recognized that certain features were desirable in a flux, and attempts were made to regulate its production and insure a more or less uniform product, rather than to take at random any refinery waste product from which the lighter oils had been removed. Specifications were then promulgated limiting the gravity to a range of from 20° to 22° Be., and the flash point to not lower than 325° F., and excluding badly cracked residuums and those which lost more than five per cent. when heated for five hours at 325° F. Such residuums contained from seven to thirty per cent. of paraffine scale, and as asphalt cements made from the hard native asphalts usually contained about eighteen per cent. of them, such asphalt cements frequently contained as high as five per cent. and over of paraffine scale. Notwithstanding this, many extremely successful pavements were laid with those cements. This is interesting in view of latter-day claims that asphalts containing over one per cent. of paraffine are very inferior for paving purposes.

When it was found that by careful distillation of asphaltic petroleums, asphalts could be produced which were just as suitable for paving purposes as those occurring in a hard state in nature, the producers of this class of asphalts followed the precedent set and turned out a hard asphalt which required fluxing before use. If they had produced a soft asphalt cement they would have had to ship it in much more expensive packages, and in hot weather it would have been difficult to transfer to the melting kettles the contents of the then almost exclusively used wooden packages without excessive loss and trouble. Sufficient tank car equipment was not available to ship it in the modern way, and flux at that time being relatively much cheaper than asphalt, the expense to the contractors would have been materially increased. With the development of new sources of asphalt came also the development of new sources of flux and it soon came to be recognized that certain fluxes were suitable for use with certain asphalts but did not give good results with others. In view of this, paving specifications began to require, besides certain limitations in character and composition for the fluxes themselves, that the flux and hard asphalt when mixed together should produce an asphalt cement which possessed certain desirable and necessary characteristics.

As a result of still further investigation, it was found that in many instances certain desirable properties could be imparted to an asphalt cement which were not necessarily inherent in the hard asphalt itself, by the use of specially prepared fluxes.

In certain industries it is extremely desirable that the fluxed asphalt should be affected to a minimum extent by variations in temperature. Specially blown fluxes will accomplish this result, but great care must be used to avoid reducing the cementing qualities of the fluxed asphalt to an undesirable extent.

From the foregoing brief review of the situation, we see that the use by the contractor of a ready fluxed asphalt cement is a recent development, and that the value and suitability of sheet asphalt pavements was conclusively demonstrated during a period in which the contractor invariably did his own fluxing. There can therefore be no question but that the fluxing of a hard asphalt by the contractor is an entirely safe and satisfactory method, provided, of course, that the operation is properly conducted, and this proviso applies with the same force to the preparation at the refinery of a ready fluxed asphalt cement.

The relative merits of the two methods is largely an economic one and must be separately considered from the refiner's, the contractor's and the consumer's standpoint.

The refiner who produces his asphalt from asphaltic petroleum may stop the distillation process at the point