PARAFFINE SCALE AND DUCTILITY.

By Leroy M. Law,
Chemist, United States Asphalt Refining Company.

THERE are other tests, besides the Fixed Carbon Test, appearing in some specifications for asphalt supply, which should be omitted until their status is better estabilshed. Among these are the tests for "paraffine scale" and "ductility."

The so-called paraffine determination is supposed to show the amount of hard or "scale" paraffine present in refined asphalt, and is, therefore, considered to be an index as to its liability to crack in cold weather or to granulate with age.

The general procedure employed in this determination is doubtless familiar, consisting of distilling the material rapidly down to dry coke and collecting the distillate. The latter is then weighed, an aliquot portion removed, dissolved in alcohol-ether, chilled, and the crystallized scale filtered off, dried and weighed. Many specifications prescribe that the scale shall not exceed a certain figure, yet few of them prescribe their modifications in detail.

The result is that each customer performs the test in a manner most agreeable or convenient to himself, and the manufacturer must stand for the whims and modifications that the customer may see fit to introduce. Usually the test is conducted in a glass retort, yet some operators substitute in its stead an iron one. That this may influence results matters little, so the manufacturing chemist must visit all these laboratories to become familiar with each chemist's details, then return home and endeavor to duplicate conditions.

Dow and Smith, using an iron vessel, have shown the effects of different rates of heating, type of condenser, etc., and they express the belief that at certain heats soft paraffines may be converted into the scale form. In the face of these experiments and opinions, we have chemists who insist that the higher the paraffine scale obtained the more accurate the method, their claim being that "you cannot get out more than there is in it."

In an effort to learn something as to the paraffine test as generally applied, the six laboratories who replied to the fixed carbon inquiry (see *Canadian Engineer* for Nov. 20th, 1913), were also asked to determine paraffine scale in the same samples. They did so with the exception of one laboratory, which, for reasons not stated, declined to make the determinations. I trust that laboratory E realizes the unscientific status of the paraffine scale test, and it was this realization that prompted them to decline to report on the subject.

Results on Paraffine Scale.

	Sample No. 213. Per cent.	Sample No. 215. Per cent.
Laboratory A.	3.6	2.8
" B.*	0.10	1.58
" C.	2.7	1.49
" D.	1.21	1.25
" F.	4.13	3.04

The above results tend to make a laughing stock of the profession, and are only printed with the hope that asphalt chemists may soon get together and study or eliminate these embarrassing subjects. Our company is furnishing a certain material to one customer, who limits paraffine to one per cent. From him we have had no complaint whatever, yet the same material is ineligible under another specification, having been reported to contain paraffine in excess of four per cent. Which chemist is right, and what is the manufacturer to do under such conflicting evidence?

Turning now to another requirement of questionable scientific value, and non-indicative of either quality or service results, I call attention to a requirement in many road oil and binder specifications which states that the material at, say, 50 penetration shall have a specified minimum ductility. The idea is that the bitumen shall possess adhesiveness, a quality best shown by the ductility test. By concentrating to 50 penetration, the standard consistency for this ductility test, all materials are brought to a uniform basis of comparison. Thus far the idea is sound, but the method of concentration—the all-important feature—is sadly neglected.

Some chemists, in a blind attempt at conserving ductility, stipulate that during concentration the temperature shall not exceed, say, 400° or 500° F. Others provide for "occasional" stirring, but generally they neglect the essential feature in asphalt treatment, namely, the agitation. In hardening the softer asphalts, agitation plays, if anything, a far more important role toward conserving ductility than does the mere restriction of temperatures.

My interviews with inspecting chemists relative to this test show that they are uniform only in following "no regular procedure." Some of them use heat-test residues which, by accident, have just reached 50 penetration, or again, this residue treated to a further heating on a hot plate or in an oven to obtain the desired consistency. Others concentrate the material from an oily state to asphaltic consistency in a single operation, either on a hot plate or in an oven, with or without agitation, as suits their fancy, and the manufacturer must ascertain, and duplicate in his laboratory, all of these eccentricities to find out the chance his material has of passing a so-called scientific specification.

On one occasion the writer submitted to a prospective customer a series of asphalt products varying in consistency from a maltha down to an asphalt cement. These were tested by the inspecting chemist, who passed the harder materials but rejected the softer ones as absolutely lacking in ductility when reduced to 50 penetration.

The chemist allowed me to look over his results, and I observed that with the material requiring the least concentrations he had secured the highest ductility, and in case of the fluid material requiring the greatest concentration to reduce it to 50 penetration, practically no ductility was obtained. All of the products were from the same primary material, the maltha, the harder ones being produced by refinery operations, which he or no one else could duplicate in the evaporation tins of an asphalt laboratory.

In the instance cited the chemist's process was undoubtedly one destructive to ductility, for the longer the heating required to reach 50 penetration, the lower the ductility of the product. The chemist avoided the issue by deciding that to his mind the test represented service conditions where no agitation of the material took place.

The two requirements above dealt with, together with the fixed carbon test previously dealt with, are examples of requirements without theoretical or practical significance.

*Material foamed considerably. Analyst is of opinion that there is no accurate method and results are only approximate.