

Nekal BX dry in the Indigo Vat

By Dr. Nüsslein

About two years ago Nekal was mentioned in this paper in connection with Indigo.¹⁾ Its use was then deprecated for the reason that, judging by the appearance, the addition of Nekal to the Indigo-Hydrosulphite-Soda vat seemed to bring about a rapid oxidation

wetting out agent was also taken up by most indigo dyers dyeing cotton from the Hydro-sulphite-Soda vat.

In view of the chemical composition of Nekal it is not to be expected that it would have any deleterious influence on any of the



Boiled nettle without addition



Unboiled nettle 1 lb. Nekal BX dry per 100 gallons

which would ultimately cause the destruction of the vat. This fear has, however, proved to be groundless and, when dyers became accustomed to the changed appearance of the vat, the product so well known as a

¹⁾ Melliand Textilberichte, page 612, 1926.

components of the vat, particularly the Hydrosulphite. A very simple test will prove this.

On preparing a vat in the usual way, for example with 1 oz. Indigo powder per 10 gallons, and comparing it with a second vat

charged in addition with 8 oz. Nekal BX dry per 10 gallons, the latter will very soon be found to lack the usual flurry, the place of which is taken by a zone of an intense blue coloration rapidly extending downward and very soon imparting to the vat a greenish blue appearance which is generally only observed in a decomposed vat.

If, on the other hand, access of air to the Nekal vat is prevented, none of these characteristics are observed. Consequently this can only be due to the immediate action of the oxygen of the air. It is also apparent that certain processes must be taking place in the vat itself. If this was not the case, the flurry must needs have formed as under normal conditions; but a perfect solution of the flurry takes place instead, a fact which should not be explained by a simple saturation and subsequent sinking of the oxidised particles. A closer investigation resulted in much extremely useful matter for practical indigo dyeing being obtained.

On pouring the two vats mentioned above into water it is surprising to note that the vat containing Nekal yields a much bluer and purer colour than the normal vat, and that the indigo remains in suspension much longer. Also after precipitation in flakes, which sometimes only takes place after weeks, a considerable difference in fineness and uniformity of dispersion of the precipitate is shown. According to this test a direct action of the Nekal on indigo is proved, whereby a complete distribution of the particles of Indigo is effected, oxidation not taking place in the usual coarse crystalline form. Microscopic examination confirmed and at the same supplemented this finding.

On examining the indigo of a vat precipitated by a current of air, and containing $\frac{3}{4}$ — $1\frac{1}{2}$ oz Nekal BX dry per 10 gallons, under the microscope, particles of only about $\frac{1}{4}$ the size of those contained in a normal vat can be ascertained which, as is well known, represent fairly thick, long rods with a pronounced tendency to form bundles or little stars with from 3—8 oz Nekal per 10 gallons the particles become smaller and smaller (abt. $\frac{1}{6}$ of the normal length) and agglomeration ceases entirely with an addition of 5 oz. From $\frac{1}{2}$ —1 lb per 10 gallons the size of the particles increases again a little but the formation of bundles and little stars becomes more pronounced.

The results of the filtering tests with filters of different sizes of pores run fairly parallel.

The particles passed through a filter of 1.5μ width of pores as follows:

vats containing	0—3 oz Nekal per 10 gallons	not at all
.. ..	5—6	distinctly
.. ..	8	very considerably
.. ..	9	considerably
.. ..	12—16	thinly.

With a width of pores of 3.3μ particles of a vat containing 3 oz per 100 gallons pass still more freely, whilst the indigo particles of normal vats are entirely retained as also in filters of 4.8μ and above.

Dyeing tests on the whole gave analogous results.

The unusual appearance of the vat quite naturally gives rise to the opinion that it will not behave so well tinctorially as the clear, yellow, normal vat, but results of practical trials — in the laboratory as well as on a large scale — prove the contrary to be the case.

When dyeing continuously, twice daily, from a standing vat until completely exhausted, i. e. without an addition of reducing agents it was distinctly seen that the normal vat loses first in tinctorial power. On the third day in the forenoon this vat had become absolutely useless. Goods were only slightly indigo stained. This staining was much more pronounced in the vat to which an addition of $\frac{3}{4}$ oz Nekal per 10 gallons had been made and the vat with an addition of $1\frac{1}{2}$ oz Nekal still produced a distinctly good shade, approximately corresponding with that obtained on the second day in the afternoon from the normal vat. Vats with higher additions behaved similarly. Consequently, notwithstanding the outwardly objectionable appearance of the Nekal vat, better tinctorial property and greater stability of the vat is given.

More interesting and valuable as well were the following observations.

An addition of $\frac{3}{4}$ oz and still more so of $1\frac{1}{2}$ oz Nekal per 10 gallons — no matter whether on raw, sized, boiled or unboiled material — resulted in a considerable deepening of the shade with a pronounced reddish cast. This deepening diminished again from 3 oz per 10 gallons, reaching a minimum with 8 oz, and only rises again with larger additions, without, however, attaining the effect of dyeings produced with $\frac{3}{4}$ — $1\frac{1}{2}$ oz Nekal per 10 gallons. With all these additions, on the other hand, a considerable improvement of purity and of the reddish cast becomes noticeable.

To be continued