

PRACTICAL TESTING OF RAW MATERIALS

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649096978

Practical testing of raw materials by S. S. Dyson

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S. S. DYSON

**PRACTICAL TESTING
OF RAW
MATERIALS**

PRACTICAL TESTING
OF
RAW MATERIALS.

A CONCISE HANDBOOK FOR MANUFACTURERS, MERCHANTS, AND USERS OF
CHEMICALS, OILS, FUELS, GAS RESIDUALS AND BYE-PRODUCTS,
AND PAPER MAKING MATERIALS, WITH CHAPTERS
ON WATER ANALYSIS AND THE TESTING
OF TRADE EFFLUENTS.

BY
S. S. DYSON.



LONDON:
LEWIS JAMESON & CO.
1901.

D. VAN NOSTRAND COMPANY,
NEW YORK.

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CHAPTER I.

The Necessity for the Testing of Raw Materials.

THE publication of this manual of practical testing is not an attempt to offer a substitute for the many valuable standard works on chemical analysis which are already in existence. The needs of the analytical chemist are well supplied. He has access to a whole library of well-written and well-authenticated text books on every department of chemical knowledge, and it would be mere presumption to offer any substitute for the recognised standard works of reference.

There exists, however, a want which this volume is designed to meet. The general users and merchants of chemicals and drysalteries are not, as a rule, versed in chemical analysis, nor are the exigencies of their business such as to demand the inclusion of a trained chemist among the members of their staff; but there are many occasions when, in buying articles of a chemical nature, it would often be very helpful—and very profitable—to be able to form an opinion as to the relative values of, say, half a dozen samples of the same class of material. For instance, a certain large manufacturer had for many years been purchasing the lubricating oil used in his very extensive works upon the guidance of a rough and ready test—he filled a jar with the oil, and ascertained the specific gravity by means of an antiquated hydrometer. The denser the oil, the higher it rose in his estimation, and he placed his contracts accordingly. But, as his business developed, and he began to use a different class of raw material, he found it necessary to engage a chemist to control the operations of his works, and, in due course, the lubricants came under examination. The chemist was a smart man, and he quickly proved, to the entire satisfaction of his employer, that the bill for lubricants was far higher than was necessary. The manufacturer was amazed to find that there

was any other test for lubricating oil than the specific gravity test, but, as the time for placing contracts again came round, he obtained a dozen quotations and as many samples. These samples were submitted to a very simple test—which will be found set forth in its proper place in these pages—and the result was that the following year's contract was placed at such a figure that the saving effected paid the chemist's salary several times over. Of course, this was a large establishment, but the same state of things exists in many works.

Another case in point. A calico printer in the Manchester district bought bleaching liquor on the test of the hydrometer. He had been purchasing liquor at a certain number of degrees Twaddell, when an enterprising traveller called upon him with a sample which actually tested twice as high in degrees, and at the same price he had been previously paying. The bleacher tested the liquor with his own Twaddell glass, but the instrument spoke for itself—it was twice as high in degrees, hence it must be twice as strong in bleaching power. The manufacturer gave a large order for the liquor, and the traveller went on his way rejoicing. The wonderful bleach liquor arrived in due course, but it speedily became apparent that it was doing less work than the *weaker* article, and, after vainly endeavouring to account for this very unsatisfactory result, the manufacturer consulted an analyst, who speedily found that the extra "strength" was attained by the copious addition of common salt, while the "available chlorine"—the active bleaching agent—was even less than in the ordinary liquor which had been discarded.

A further example of the necessity for the control of raw materials, and especially of chemicals, may be quoted. It is by no means an uncommon case, and also relates to bleaching materials. In the paper trade large quantities of bleaching powder are used, and in some mills no test is ever made. The powder is sold as containing 35 per cent to 35½ per cent of available chlorine, and in many mills the invoice is "taken as read." A certain paper maker had been receiving his supplies of bleaching powder from one of the largest firms of makers for a number of years, and was very fond of boasting of the excellent qualities of his bleach—it was above suspicion (mainly because it bore a well-known brand). He, too, swore by the Twaddell glass, and it was a difficult matter to persuade him of the necessity for any

chemical test. Eventually, however, a member of the staff, who was possessed of a certain amount of chemical knowledge, obtained permission to exercise his skill upon the supplies of bleach which came into the establishment. The results of his work showed that, instead of receiving bleaching powder containing $35\frac{1}{2}$ per cent of available chlorine, the chlorine contents were never more than 33 per cent or 34 per cent. When it is remembered that each 1 per cent of chlorine means 3 per cent on the invoice, the meaning of this statement will be appreciated. How long this state of affairs had been existing it would be hard to say, but close supervision for five or six weeks showed that no bleach came into this particular mill which tested anything like the contract strength. When matters were ripe the attention of the manufacturers was called to the subject, and they at once went into a fit of righteous indignation at the mere suspicion of such a thing as *their* bleach being weak. Such an assumption had never been made before, they protested, and the users were surely mistaken. But the paper maker was obdurate; he sustained his claim, and—this is the point—the same makers now send him bleaching powder which *never tests less than 37 per cent of available chlorine!* The apparatus necessary for the test—which is a very simple one—did not cost many shillings, but the effect on the bleach account of the works was such that now the paper maker in question will never admit a delivery of bleach which has not passed the analysis of the works chemist.

Again, with regard to fuel. Another manufacturer, who has profited by ripe experience, will not place his coal contracts until he has had the samples submitted to him properly tested for their fuel value. He generally submits to analysis perhaps half a dozen samples of slack from different mines, and the result is that often the highest-priced slack is far from being the most valuable as a fuel, while a sample at a lower figure has a very much higher value for steam-raising purposes. The point of this instance is that this particular manufacturer burns some 5,000 tons of coal yearly, and it does not need much discernment to see that even a small percentage of saving will effect a remarkable difference in a year's coal bill, and with fuel at present prices it is surely worth the while of large coal users to see that they at least get the best value for their money.

Such instances as the foregoing might be multiplied indefinitely, but one more must suffice. Again referring to the paper trade, most people are aware that enormous quantities of wood pulp are now used in the manufacture of paper. This pulp is sold on a basis of so much per cent of dry fibre in the material—a “dry” pulp must not contain more than 10 per cent of water, and a “wet” pulp must not test more than 55 per cent of moisture. In one of the largest mills in England, many thousands of tons of pulp were consumed annually, yet, until comparatively recently, not a bale was ever tested. The manager declared that he dealt only with “honest men,” and scouted the idea that he was ever “done.” Yet here again, one of the staff—not a trained chemist—found, almost by accident, on the application of some little knowledge of commercial testing, that his firm, although they dealt invariably with “honest men,” were paying yearly for hundreds of tons of water at from £3 to £10 per ton. A close system of testing was instituted, and the result is that at the present time this particular firm is effecting a clear saving of close upon £2,000 a year.

Wherever chemicals, oils, drysalteries, fuels, or any similar raw materials of varying strength or composition are employed, the quality of the article should *never* be accepted on the word of the seller. Instances have been mentioned with a view to illustrating this contention, but the principle should be applied *invariably* wherever goods of uncertain strength are concerned. It is well known that many chemical works have two classes of customers—the people who test their goods, and the people who do not test at all. The former class gets high strength deliveries, the latter gets whatever is left. Users of chemicals, lubricants, fuels, etc., have very little idea as to the truth of this statement. It is only when they come to apply such simple, yet reliable tests as will be found in these pages, that the situation is seen in its true light. We have nowadays continually dinned into our ears the never-ending story of German superiority in commercial matters, yet one very important factor of German commercial keenness is often lost sight of, and it is this: The German manufacturer does not take the quality of his raw materials for granted; *the English manufacturer very often does.*

It is not necessary that every works should number a trained