

Lovibond Color Standards—Crisis or Challenge?

J. T. R. ANDREWS, Procter and Gamble Company, Cincinnati, Ohio (prepared at the request of the A.O.C.S. Color Committee)

(EDITOR'S NOTE: In view of the widespread interest in the availability of Lovibond color glasses the following article has been prepared by a member of the Uniform Methods Committee of the American Oil Chemists' Society at the request of G. W. Agee, Chairman of the Oil Color Committee. It will be noted that Tintometer Ltd. of England can supply these glasses, as was announced in the February 1948 issue, page 21, but only within certain limitations and under special circumstances.)

FOR more than half a century the fatty oil industries of the United States have accepted and used Lovibond Color Standards* for process control and commercial transactions. The shortcomings of this system of color grading have been apparent to all users, but its simplicity has insured its continuation in official methods and trading rules.

During the past 25 years these standards have been the object of a tremendous amount of study and research by American scientists. The names of Priest, Gibson, Harris, Judd, Walker (Haupt), Mc-Nicholas, Wesson, Stevenson, and Estey are familiar to oil chemists because of their valuable contributions to improved methods and apparatus for oil color grading by Lovibond Standards. Much of the study of the glasses themselves was done by the Bureau of Standards of the U. S. Department of Com-

*A monopoly of The Tintometer Limited, Milford, Salisbury, England.

merce though it would be unfair to omit mention of the excellent work done by the various committees on color created by the A.O.C.S. and the support rendered by trade associations. In view of the present situation it might be well to reflect whether this time and energy might have been expended more profitably in the direction of developing an entirely different mechanism for color grading, one distinctively American in its utilization of our inventive genius and the products of U. S. industry.

Even before World War II Lovibond Color Standards became increasingly difficult to obtain, regardless of price charged. During the war it was necessary to "make do or do without," and patience became a patriotic virtue. With the cessation of hostilities and the sensational development of the soybean industry, demand for an increased supply of standards became imperative. In order to clarify the situation R. R. King, chairman of the Uniform Methods Committee, engaged in correspondence with The Tintometer, Ltd. to inquire regarding prospects for future delivery and quality of Lovibond Standards. The following excerpts from this correspondence are indicative of the attitude taken by Tintometer, Ltd.

Letter from R. R. King to The Tintometer Limited, 8/27/47:

The many branches of the fatty oil industry in this country are in dire need of additional Lovibond glasses (preferably slides $\frac{3}{4}$ " x 2", discs can be adapted) for use in reading colors on oils. Minimum standard sets consist of the following red and yellow glasses: (Here are listed set requirements from A.O.C.S. Methods Cc 13b-45, A-3.)

All of these glasses must be standardized by either the Bureau of Standards of the United States Government or the Electrical Testing Laboratories of New York City.

A recent set of discs received by a large company in this country, through Arthur H. Thomas Company in Philadelphia, was found to be unsatisfactory for standardization because of non-uniformity in transmission and pronounced distortion. We presume these glasses were manufactured by your organization.

We are very anxious to know whether you are in a position to serve promptly the various industries of this country with Lovibond glasses in the manner you so ably served us during the many years prior to World War II. We are extremely appreciative of the service you have rendered in the past and hope that conditions with you have returned to reasonable stability, considering world conditions, so that you can resume serving us with our Lovibond glass requirements.

Will you please cable me collect indicating what your present and future position may be on this urgent problem? We trust that your prompt reply will inform us in sufficient detail to make prompt industry-wide plans for immediate color problems. Any suggestions you may have will be greatly appreciated. The problem is urgent and we know that we can count on your able cooperation.

Letter from The Tintometer Limited, G. J. Chamberlin, director, to R. R. King, 9/13/47:

We are in receipt of your letter of the 27th August, which is receiving very careful study and consideration.

We have already had several technical conferences on the matter at this factory, and a carefully considered reply will come before the Board. We hope to let you have this as soon as possible.

Letter from The Tintometer Limited, A. J. Fawcett, chairman, to R. R. King, 9/24/47:

Further to our letter of 13th September, we have carefully considered the various points raised in your letter of the 27th August and now send you our reply and observations.

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U.S.A. Demand—We are fully aware of the demand in the fatty oils industry of the U.S.A., which you represent, for additional supplies of Lovibond Colour Standards.

World-Wide Demand—The demand in your industry, in your country, is but a comparatively small part of the problem that confronts us for practically every industry in every country in the world is ordering our colour-measuring instruments in ever-increasing numbers.

Pre-War and Post-War Output—During the past two years, since our firm was freed from special wartime contracts, we have re-organized our business, and *our output today is at least three times as great as at any time prior to 1939.*

We are taking energetic steps still further to increase this output, but it must be understood that the production of Lovibond Colour Standards is a slow and intricate job and that they cannot be produced on mass production lines. They have to be produced by laboratory methods and, as they are in fact standards, the production is of necessity very slow, as no visual tolerance is permissible.

World Shortage of Lovibond Standards—It must be appreciated therefore that although our output has increased and we hope will continue to increase, Lovibond standards will remain in very short supply.

Economy in Use of Lovibond Standards—We would recommend the centralization of laboratory work wherever possible in order to make the best possible use of the standards that are available for we can hold out no hope of our being able to meet the world-wide demand for our Standards fully for many years.

Old Style $\frac{3}{4}$ " x 2" Standard—We do not propose ever again to manufacture these large standards. Firstly, because it is wasteful to use such large pieces when a smaller piece is sufficient. In the original 2" x $\frac{3}{4}$ " glasses only the small area was used which is now the complete size of our present standards ($\frac{3}{8}$ " x $\frac{3}{4}$ "), and the rest was merely used for handling. Secondly, because the change to the smaller standards was in part made to stop the wrong use of our standards by a section of the scientific instrument-making industry in U.S.A. (See reprint enclosed), *International Sugar Journal*, 48, 158 (1946).

We would here point out that the trade in loose standards has been with U.S.A. only; without exception, every other industry in every other country has bought our instruments completely fitted with standards.

U.S.A. Bureau of Standards—We have recently had a visit from Dr. Deane B. Judd, chief of the Colorimetry Division of the U.S.A. Bureau of Standards, and from him you will be able to learn of the endeavours that we are making to meet the demand for our standards in all markets.

U.S.A. Criticism of Lovibond Standards—We note your remarks regarding a recent set of Standards supplied by us to Arthur H. Thomas and Company. We shall be glad if you will let us have a very full report regarding this.

Lovibond Standards are not designed for re-standardization outside our factory, and it is quite possible that, if collimated or focussed light were used in recalibrating, distortions in the glass would make for non-uniformity in transmission.

Lovibond Standards, when used in our instruments, are looked through at 90° against a diffused light, and under such conditions the distortions in the glass, which are unavoidable in their method of production, are entirely immaterial.

Our current grading for colour is correct to well below a "least perceptible difference" on the Judd projection of the C.I.E. triangle, and any attempt to work to finer limits which cannot be appreciated by the normal eye is, in our opinion, not only unnecessary but definitely misleading. These glasses are designed for the simple colour matching of visual colour impressions and not for comparison with transmission curves.

Any restandardization therefore in U.S.A. we regard as an entirely domestic matter in which we cannot concern ourselves.

The origin of the recalibration of our Standards in U.S.A. was brought about in the main by the mis-use of our Standards by certain U.S.A. firms making colour-measuring instruments. Also we regret that at one time between 1915 and 1925, after the death of J. W. Lovibond (the inventor of the Lovibond Colour Scale) and prior to the introduction of our present methods of calibration, unfortunately a few defective glasses from our Works found their way on to the American market. Since 1925 our methods have ensured that every Standard is guaranteed to be accurate to below a "least perceptible difference" on the Judd projection of the C.I.E. triangle.

Holders for New Size Standards—We recently circularized the U.S.A. scientific instrument makers trade with samples of aluminum holders for the new small Standards $\frac{3}{4}$ " x $\frac{3}{8}$ ".

Actually we made these holders to the design of one of the large oil companies, who gave us their permission to pass on the design to the trade in general.

New Demand from U.S.A.—During the war a large number of U.S.A. scientists with your Fighting Services in Europe



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used our colour measuring instruments, and on their return to U.S.A. they have ordered direct from us similar instruments for use in their own laboratories.

Future Cooperation—We assure you that we are prepared and anxious to do our utmost to help you all we can. We fully appreciate the great inconvenience the lack of supplies of our standards throughout the war years must have caused you. In fairness to ourselves, we would point out that this was due to circumstances altogether beyond our control and that whereas your industry was suffering through lack of supplies, your Fighting Services in fact took a very large quota of our instruments for analytical and pathological purposes.

Priority to U.S.A.—We have, during the past two years, given considerable priority to U.S.A. orders in an endeavour to make good the deliveries lost during the war, and for B.D.H. Type Lovibond Tintometers we are now quoting six months delivery to U.S.A.; whereas for our own home trade delivery is from two to three years.

World Standardization of Colour Measuring Instruments—We believe that we shall in the long run give to your industry the best possible service if, in the future, we supply only complete colour measuring instruments fitted with our Standards and discontinue the sale to the U.S.A. market of loose standards except to replace broken standards and with the exception of continuing the supply of A.S.T.M. and TAG petroleum grading standards which are compound glasses. This would ensure that with a universally standardized light source, existing anomalies, such as those of which you advise us, would be removed. Such anomalies are due to our standards being used in a variety of instruments without due regard being made to the important factor of a standard and appropriate light source.

Booklet Colorimetry—We are sending under separate cover a copy of our booklet Colorimetry which illustrates and describes two types of Lovibond Tintometers, namely the Lovibond Tintometer B.D.H. Pattern and the Lovibond Schofield apparatus. These instruments are used throughout the world, and we recommend you most strongly to influence your industry to adopt our suggestion.

As previously mentioned your younger scientists are already adopting these instruments. We are prepared to receive back glasses from users and adapt and fit them to our standard instrument.

Letter from The Tintometer Limited, A. J. Fawcett, chairman, to R. R. King, 12/13/47:

Further to our letter of the 24th September, and your acknowledgment of October 3rd.

Complications have arisen in countries outside the U.S.A. by the existence of the two colour scales which are used in your country, namely

1. The internationally accepted Lovibond Scale.
2. The U.S.A. Bureau of Standards N° Priest Gibson scale.

Our name has, in the past, been associated with both of these scales.

The new difficulties, which have arisen as the result of the existence of the two scales, has confirmed us in our view that we must at once discontinue the sale or use in instruments not approved by us (with the exception of the compound colour standards which we supply to certain trades and single standards for turpentine testing) and confine our attention entirely to the manufacture of standards fitted into instruments of our own manufacture.

We are therefore advising our U.S.A. customers that we regret we must cancel all orders outstanding on our books for loose glasses.

P.S. We will do all we can to assist owners of existing sets in the replacement of broken standards if they will communicate their requirements to us.

Further light on the decision by The Tintometer Limited to reduce the size of Lovibond Standards may be gained from the following letter from A. B. Carter, manager, Technical Service department of Central Scientific Company, Chicago, to J. T. R. Andrews, 7/14/46. Two sentences are printed in italics for emphasis.

We are soliciting your advice in connection with an adapter which the Tintometer Limited produces for use with the smaller

Lovibond glasses currently being produced. The old glasses, with which you are familiar, measured 2" x 3/4". They were produced from sheet glass which was fabricated in Germany. The manufacturers are not able to produce similar glass in England in sufficiently large sheets to warrant cutting the large pieces for standards. We are sending herewith the sample holder which we have just received from London. Kindly comment on it, as well as the size of the glass, with respect to its use in your industry. We hesitate to import any more Lovibond glasses if they must be the small size.

(The glass opening in sample submitted was 9 mm. x 17 mm. Holder was 2" x 3/4".)

Letter from J. T. R. Andrews to A. B. Carter, 7/18/46:

We have examined and tested the new and smaller Lovibond glass in the holder which you sent us recently.

While this assembly may be made to operate satisfactorily in either the Wesson or the Stevenson types of colorimeter, we do not like glasses so small in size and would not use them except in cases of the greatest necessity.

It is our feeling that this reaction will be general in the fatty oil industry. Therefore we would not advise the importation of the new glasses if it can be avoided.

That Tintometer Limited recognizes the non-uniformity of the glass from which Lovibond Standards are cut is apparent from the following paragraphs of a communication by G. J. Chamberlin of Tintometer Limited on "Accuracy of Lovibond Colour Slides," published in International Sugar Journal, 48, 158 (1946):

We have recently been to considerable pains to ascertain the cause of the occasional adverse criticism of Lovibond colour standards that appear from time to time in technical journals in the U.S.A. To that country we have for many years exported Lovibond colour standards "bare". To all other countries and

to our customers at home we have supplied the standards only in conjunction with colour-measuring apparatus of our own manufacture.

It appeared obvious to us therefore that, as the criticism appeared to come from the U.S.A. only, the inaccuracies complained of were not inherent in the Lovibond colour standards, otherwise we should have had many complaints from our own scientists and those of all the other countries of the world, who use Lovibond colour standards. We have discovered the reason for these reports emanating from our friends in America, and the explanation is a simple one:

The old-type Lovibond colour standards or slides measured 2" x 3/4"; but only a comparatively small area, being that portion of the slide which came into the "field of view" in the instruments of our own manufacture, was necessarily true to the colour value with which the slide was marked before leaving our works. This fact was unfortunately not appreciated by all the American makers of colour-measuring instruments, who have cut up the standards for use in their instruments and classified all the pieces cut from the one slide with the maker's colour value of the graded portion.

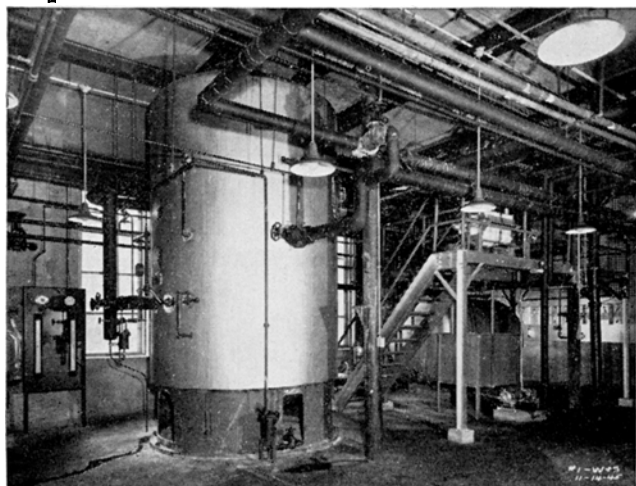
It might so happen that, in the case of individual slides, this colour classification might be wholly accurate, and so no harm would have been done; but with other slides there might be a variation of as much as a whole Lovibond colour unit in different parts of the one slide.

The excerpts quoted make it clear that we cannot get Lovibond type to increase the number of A.O.C.S. color reading units as required to take care of the soybean industry. The Oil Color Committee, the Uniform Methods Committee, and Governing Board of the A.O.C.S. are aware of the situation. The Oil Color Committee has been working on the development of a photocell method of reading color for several years and is in a position to recommend new methods as soon as the oil industry is in a position to put them into operation.

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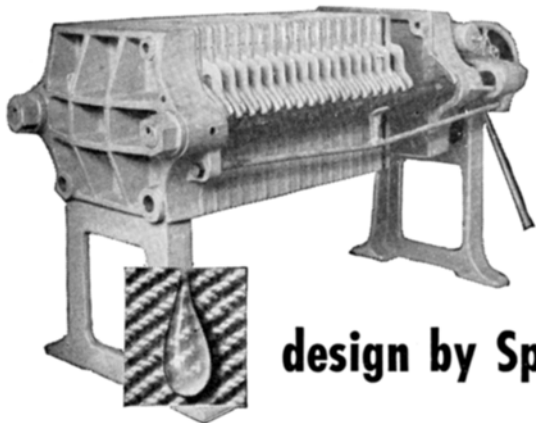
Marion H. Gwynn, consulting chemist and chemical engineer, has been licensed to practice professional engineering in the states of New York and New Jersey. Mr. Gwynn has otherwise extended his training and laboratory facilities to render broader service in catalytic and fatty chemistry and engineering. He lives in Mountain Lakes, N. J.



TRANSLATE METHODS INTO PORTUGUESE

Acceding to a request from Dr. Joaquim Bertino de Moraes Carvalho of the Instituto de Oleos in Rio de Janeiro, the Governing Board has given him permission to translate the 1946 edition of the Methods into Portuguese. This is the first time that a request has been made to translate the Methods into a foreign language for the manual has received wide acceptance in its English language form, being sent all over the world. V. C. Mehlenbacher of Swift and Company, Chicago, Ill., is technical editor.

HOMER S. POWLEY has been named technical adviser of the Coldstream Products Company, San Francisco, Calif.



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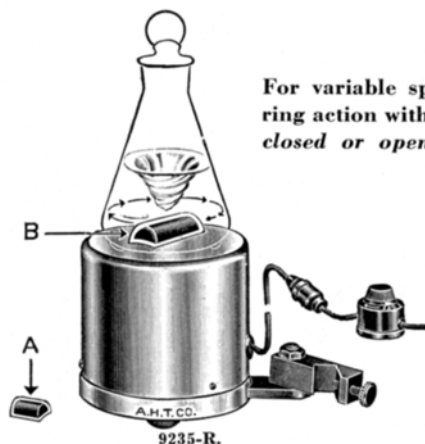
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