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Modern lipstick base manufacture

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Synopsis—Two different lipstick base manufacturing processes are described. Both methods can yield very good products but the amount of work and cleaning involved in the first method greatly exceeds that in the second. Furthermore, as demands rise the first method cannot be easily adapted for higher operating rates.

In most manufacturing industries today, good process operators are difficult to find and retain. In our own field of toiletries and cosmetics, although products are clean and easy to use when they reach the consumer, many difficulties are encountered when raw materials and cosmetics in bulk come to be handled within the factory. These difficulties are aggravated by the fact that by and large we are an industry involved in making large numbers of smallish batches. Unless methods are carefully thought out initially and then periodically reviewed, the process worker can have a job which is unenviable, involving struggles with heavy containers and contamination of clothing with colour, oils etc. If this sort of situation persists, labour turnover often rises, and interest in the job certainly declines with the inevitable lowering of quality standards.

Method I

Three basic intermediates are prepared initially and stored for subsequent use. Their methods of manufacture are indicated by the flow charts in *Fig. 1.*

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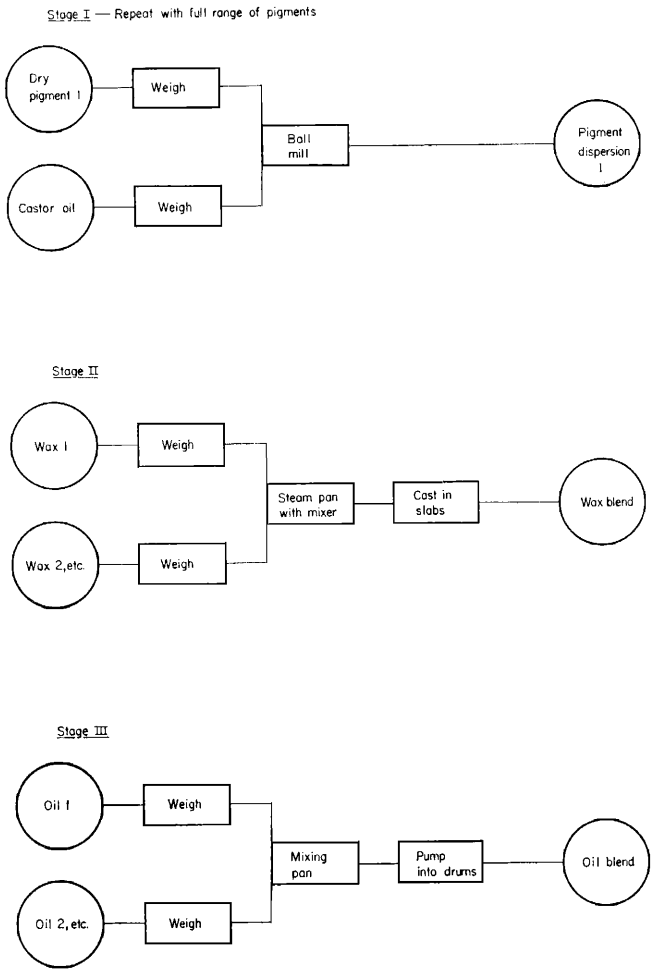

Figure 1 Preparation of intermediates—Method I

Stage I—Preparation of pigment dispersions

First of all, a single dry pigment is weighed out into a ball mill together with an appropriate quantity of castor oil. The mill is closed and the chamber is placed on live rollers overnight for the pigment to disperse. Next, the colour dispersion is drained off or bailed out according to its consistency. The mill chamber is then cleaned thoroughly by trundling several times with oil, and finished off with absorbent material.

This process is repeated with every individual pigment used in the lipstick colour range. The result is a series of very good individual colour dispersions in castor oil. To obtain them, however, there has been a lot of handling of drums and cumbersome ball mill chambers, whilst the amount of cleaning created is phenomenal. The cleaning is also of a type which makes it impracticable to use a bath of any sort and thus reduce its drudgery.

Stage II—Preparation of the wax blend

The solid constituents of the formula are weighed out into a steam pan, melted and mixed. The blend is drawn off by bucket, and then cast into slabs.

Stage III—Preparation of the oil blend

The various oily materials of the formula, except for castor oil, are weighed into a suitable tank, mixed, and the blend is pumped into drums for storage.

The foregoing three components, together with perfume and further castor oil are mixed, as indicated by the flow diagram shown in *Fig. 2.*

Stage IV—Preparation of the lipstick base

Because the pigments are stored in suspension, they must be stirred up before being weighed out in the right proportions for the shade being made. The mixture of colours is then stirred together and passed through a colloid mill. In the meantime, the wax and oil blends together with further castor oil are weighed, heated and stirred together until homogeneous. The colour dispersion is then added, thoroughly mixed and then the lipstick is tested for shade. Finally, the perfume is added, and the mass is drawn off by bucket and cast into trays for storage.

Discussion of method I

When reviewing any manufacturing process from the operational viewpoint, we should ask ourselves the following two questions:—

(a) Are we doing unnecessary work?

(b) Are we doing necessary work in the easiest way?

If the answer to (a) is 'yes', and to (b) 'no', the progressive company

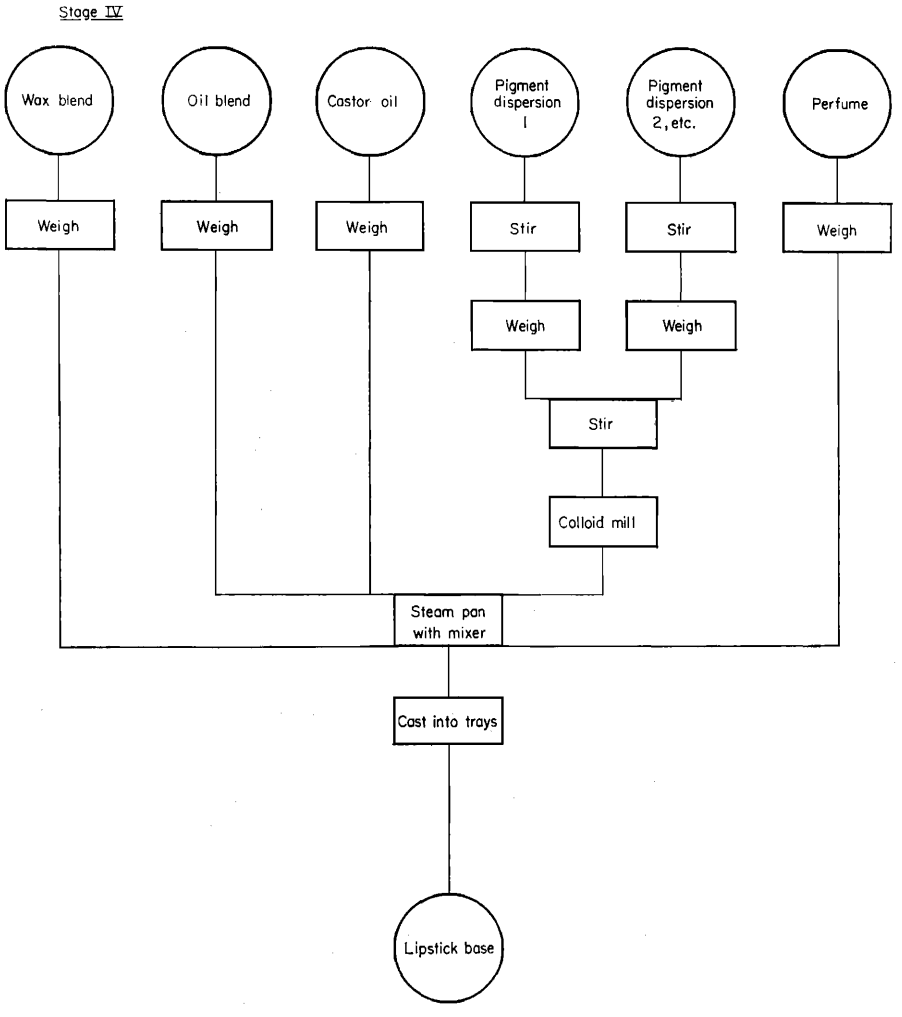

Figure 2 Preparation of lipstick base—Method I

faces the facts of the situation and invests sufficient capital to rectify matters, knowing full well that dividends will accrue in the way of higher output and quality with fewer mistakes.

Looking at *Method I* from the standpoint of these questions, we must first of all try to find a replacement for the ball mill which is a batch machine of high weight and low capacity and as already pointed out, very difficult to clean; colour dispersion, however, is the most important part of

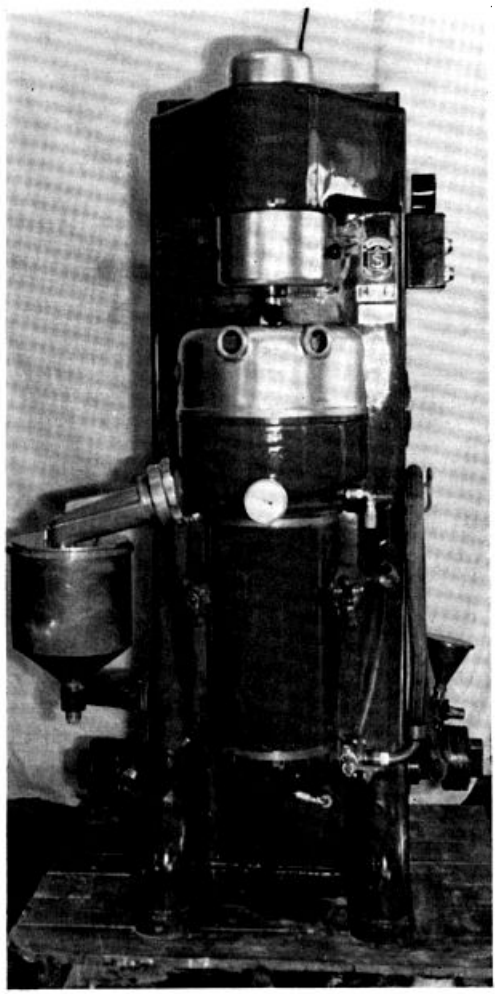

Figure 3 Typical sand mill

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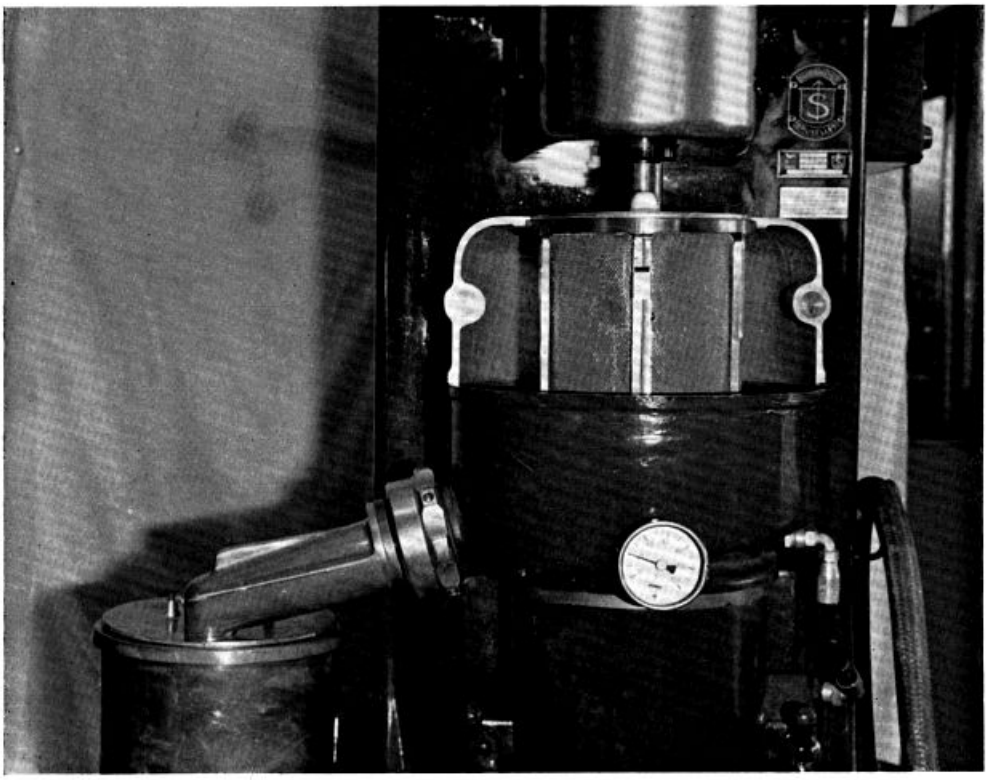

Figure 4 Sand separation screen

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lipstick base manufacture, and therefore any replacement must be of at least equal performance. A survey of the various types of milling machine available would quickly indicate the sand mill as being ideal for our purpose and without serious disadvantage.

Description of the sand mill

This machine will quickly convert a pigment/oil mixture prepared with a simple mixer into a pigment dispersion equivalent to that produced on the ball mill. The principle of operation is that the pre-mixed pigment/oil mixture is pumped through whilst specially graded sand or other media is kept agitated by a special impellor consisting of a series of discs spaced along a shaft. The rate of pumping can be varied to suit the degree of milling required. Obviously, the longer the mixture dwells within the mill, the greater is the disruptive effect of the sand. Finally, the sand is separated from the colour dispersion by screening at the top of the mill. The colour is then pumped away to where it is needed without intermediate handling. Although the sand mill is a continuous machine, it can also be used for batch processing as will be noted when Method II is described. *Figs. 3* and *4* show a typical sand mill with its input and output pumps, and sand separation screen.

Improvement of storage, handling and cleaning

By starting each individual shade directly from dry colour rather than from pigment dispersions in castor oil, the practical problems associated with sedimentation on storage, would be avoided.

The concept of blending the raw materials apart from colour and perfume, into two groups, i.e. oil and wax, is clearly correct because it reduces the overall number of weighings when large numbers of batches need to be made. However to reduce the handling further, why not include the castor oil in the oil blend and store in a tank, using a pump and meter for dispensing purposes? We should also consider whether we could store the molten wax in an inert atmosphere and handle once again by meter, straight into the final mixing pan. Furthermore, in casting the lipstick base into trays an intermediate container was used where a combined mixer and pump would have avoided this.

As far as facilitating cleaning in a lipstick department is concerned, provided the scale of operations is reasonably large, a trichlorethylene

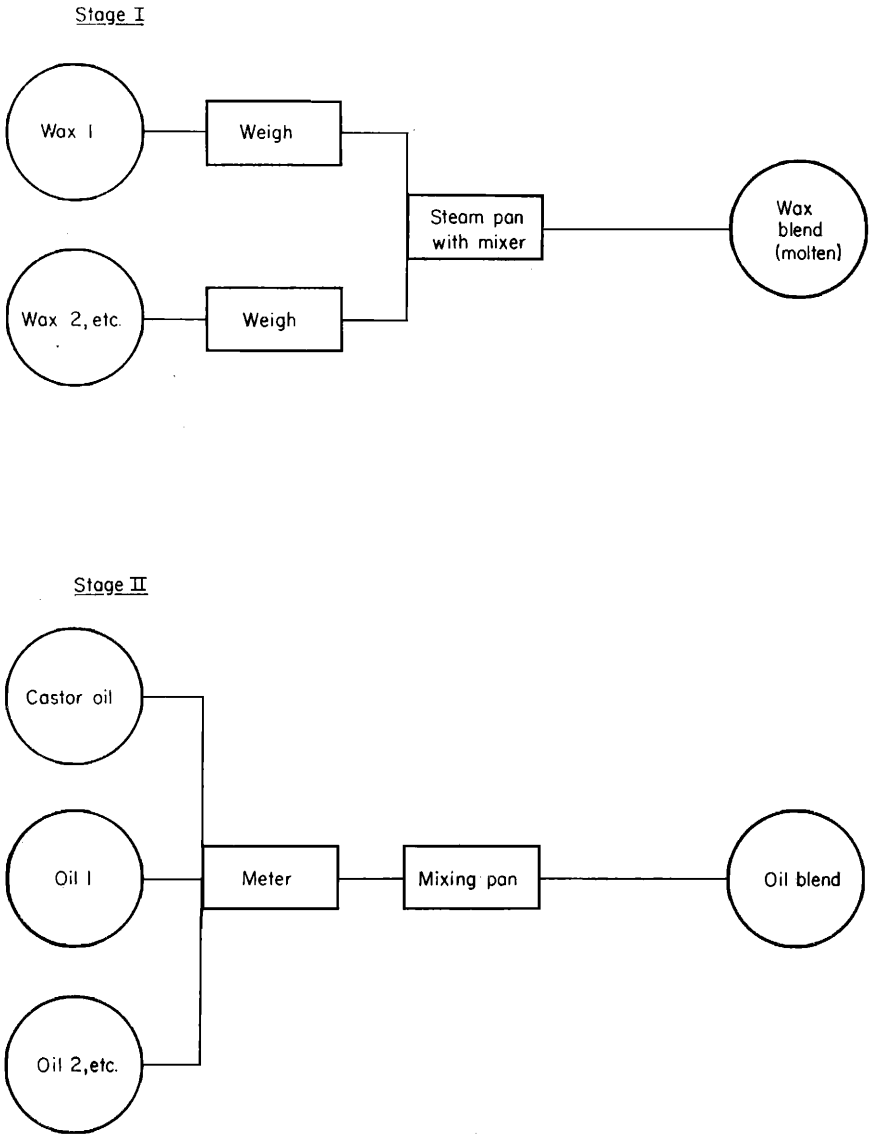

Figure 5 Preparation of intermediates—Method II

degreasing plant is easily justifiable and considerably eases the operator's life. It also follows as a corollary that when such a plant is installed, any further equipment being contemplated should be critically examined to ensure that as many of its parts as possible can be cleaned in trichlorethylene. It is perhaps not surprising that such consideration can be a great morale booster on the factory floor.

From the foregoing, it is now possible to develop a second method of manufacture which is faster and cleaner.

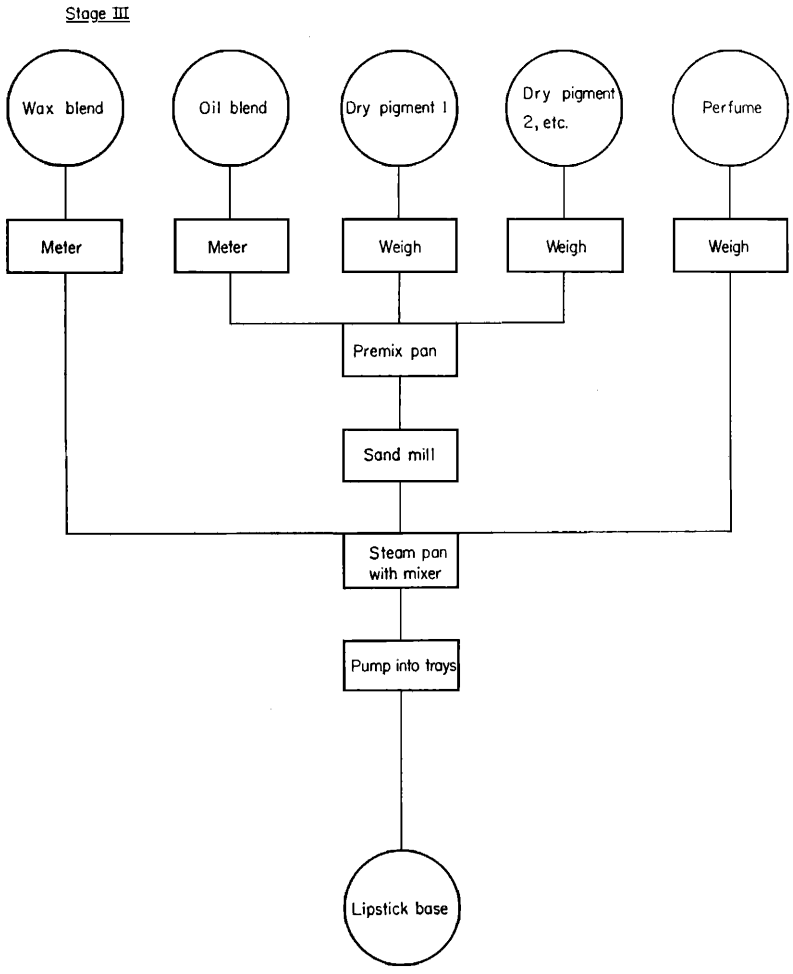

Figure 6 Preparation of lipstick base—Method II

METHOD II

This time, as shown by the flow diagrams in *Fig. 5*, only two basic intermediates are prepared initially.

Stage I—Preparation of the wax blend

The procedure is as for Method I, except that the blend is stored molten as suggested above.

Stage II—Preparation of the Oil Blend

This is made by metering the various components into a storage tank fitted with a suitable mixer. When required, the oil is metered to where it is needed rather than being weighed out.

The wax and oil blends together with dry pigments and perfume are mixed, as shown by the flow diagram in *Fig. 6.*

Stage III—Preparation of lipstick base

A proportion of the oil blend is metered straight into the premix pan attached to the sand mill. The dry pigments are weighed out and stirred in. The slurry is passed through the sand mill straight into the steam pan, fitted with a combined mixer and pump. Any residual colour is flushed from the premix pan and sand mill with the balance of the oil needed.

Simultaneously, the wax blend is metered into the steam pan. After mixing thoroughly the base is tested for shade and the perfume is added. It is then pumped into storage trays, using the mixer as a pump. As a matter of interest, because the wax blend is molten and the colour dispersion comes away from the mill at about 60°, very little further heat is required in this process.

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DISCUSSION

MR. K. MARSHALL: Have any attempts been made during the work described, to assess the amount of the grinding media which has undergone reduction to a size where it is possibly present in the product?

THE LECTURER: We normally use a Hegman gauge for testing and our grind runs off this. This indicates that we are not getting gross contamination of sand in the product.

MR. T. A. BROCK: What are the possibilities of ground sand getting into your lipsticks?

THE LECTURER: Initially, the charge of sand in the mill is cleared of "finings" by recirculating oil. When this has been satisfactorily completed, subsequent millings are always passed through a fine safety screen. We have no evidence that sand appears in our product. It certainly does not show up in any way that a consumer could detect.

MR. T. A. BROCK: Have you tried checking this by keeping a watch on the rate of loss of sand from the sand mill?

THE LECTURER: So far the mill has been running about 6 months and there has been no significant loss of sand. Obviously the media must wear away very slightly, but this applies to all methods of milling. As the particles are worn small enough to pass the grinding shell screen, they are caught on the safety screen.

MR. R. G. BAINES: There seems to be some misunderstanding concerning the sand mill. May I say to begin with that this is a machine which is in competition with our own equipment but nevertheless I feel it should have fair consideration. The very term "sand" sounds horrible and it makes you feel that you are going to do your lips with sandpaper. In fact a special grade of "Ottowa" sand is used which has a very close particle size. Its shape is also very even. Although I have no knowledge of the sand mill's use in this particular application, I do know that it is used widely in the ink industry, and the effect of sand on the printing roll would be very detrimental indeed. The fact that these machines are widely used indicates that the degree of wear of the sand is very small.

MR. G. A. ALLMAN: Where do colour corrections take place?

THE LECTURER: Should a shade deviate, we prepare a normal lipstick base containing a high concentration of the appropriate individual colour, and then add it to the bulk in the appropriate proportion.

MR. G. A. ALLMAN: So you are processing individual colours.

THE LECTURER: No. Normally we work straight from dry colours and treat any shade deviation as exceptional. We have to budget for these exceptions, of course, and over a period it is likely that we will build up a stock of individual lipstick colours in lipstick base, to add if and when needed.

MR. A. JEACOCK: What are the constraints in doing the whole operation in one pot? Perhaps it would be feasible to use some type of dispersion mixer—omitting sand—so that you premix, disperse, and then add your molten wax after the dispersion stage.

THE LECTURER: I do not know of any machine which will do this. Theoretically, if you can find the right dispersing machine, this would be an ideal solution to the problem. In practice, however, the slightest dead spot could be disastrous, and because of the nature of the lipstick raw materials used, it might also be difficult to ensure that the materials flowed properly to the dispersing head. I am thinking particularly of the most difficult part of the process, i.e. getting the colour properly dispersed. Having passed the colour through a conventional mill, it is known without any doubt, that the end product has been adequately dispersed provided the mill is

properly set up. With the method you are proposing, it is possible that one could end up with a mixture of dispersed and undispersed colour, unless great care is taken by the process operator.

MR. J. M. TRIGGLE: I have absolutely no knowledge of the sand mill, but when grinding various pigments on a three-roller mill, it is necessary to have entirely different conditions on the mill, for the optimum conditions of different pigments. Now, where you have a mixture of pigments going through the sand mill under one condition, is there any flexibility within the sand mill to allow for the different conditions necessary for each pigment?

THE LECTURER: We have not found any problem in this respect. We have established a compromise setting for the mill and find that we achieve satisfactory results if we process our various shades of lipstick in this way.

MR. J. M. TRIGGLE: Is the setting constant for all shades and the single pigments as well?

THE LECTURER: Yes.

MR. R. SOMERVILLE: Have you noticed any degradation of the wax base when keeping it in the molten state for long periods?

THE LECTURER: We make up sufficient wax base to last us for approximately one week. The tests carried out with molten wax stored in an inert atmosphere indicate that it is slightly better when standing hot for a period, because of the settling of unwanted debris which would pass through normal screening gauzes.

MR. J. C. MCCARTHY: Did you ever consider a carborundum mill instead of a sand mill, and if so, why did you reject it?

THE LECTURER: The drawbacks were that a fair degree of skill is needed to set this mill up, and a multiple pass is also necessary. Admittedly one could use a "cascade" process but we felt that the sand mill offered more advantages.

MR. A. FOSTER: Could you comment on the rather formidable cleaning problems which I envisage? We see that the only proof you have of the sand mill being clean is that clean oil has gone through it.

THE LECTURER: We are quite certain that there are no pockets at the feed in and feed out stages of the mill because we are able to strip off the parts and clean them in the degreaser. As far as the grinding shell itself is concerned, by exposing its integral sieving screens, it is quite obvious when the machine is running clean. If the mill is run whilst the sand is being cleaned, because of the turbulence it is inconceivable that the sand itself would not be thoroughly cleared of colour.

MR. A. MCGEE: Could you give us some indication of the speed of the process compared with other methods?

THE LECTURER: For a 4 min dwell within the sand mill, one needs approx. 6 hr running in the ball mill.