

THE CHEMIST IN INDUSTRY

By H. B. LANYON PAUL, M.Sc.

Apart from the purely chemical industries the chemist is a comparative newcomer to manufacture, more especially in the field of foodstuffs. His advent has received a somewhat mixed reception, and in a few cases of which I know there has been no reception at all. In some cases wonders have been expected from him in a few of which he has had the fortune to turn up trumps. In others he has just demonstrated that he was human after all. But on too many occasions he has been received as a "nosey parker" with but questionable value.

It was shortly after the Great War that manufacturers became chemist-conscious and the species were pursued with a vigour that seems wonderful in these hard times. As a result industries suitable for the application of chemists flourished while others continued more or less as before, because the employers did not know what to do with the man when they had got him, and he was unable perforce to enlighten the employer. Generally, however, these men graduated to works managerships in which positions they were generally eminently successful, because they were not, as is popularly supposed, incapable of anything but gazing in awful concentration at a test tube. But this is a superstition that is dying hard.

Now it is unnecessary for me to tell you that a chemist is most useful in an industry which uses a raw material of variable character to be made into a final product of finer quality, with perhaps a number of waste products with potential economic value. In such circumstances he can, by increasing plant efficiency, save his firm expense in the treatment of the main product and increase the scope of the firm by exploitation of by-product.

It follows from this that he must not only have an intimate knowledge of the factors governing the working of the final product, but a knowledge of the working of the machinery employed. Would it not seem then feasible that he should control the machinery and logically the works? Who could give a better idea of the meaning of the figures that his department provides, or how those figures could be improved?

This, then, is my thesis. A chemist is by his knowledge of process work eminently suitable for direction of a chemical industry (and how many foodstuff manufacturers are not chemical industries?) While the superstition that outside his laboratory he is childlike in his simplicity and incapable of controlling men is so belied in practice, that no discussion is necessary. One wonders, though, about the origin of the superstition.

In England now the chemist has really been accepted as a useful member of a firm and not as a

luxury, as I was told that he was in the not too distant past. It is surprising the number of apparently small companies that have their chemists. I have in mind the smaller confectionery manufacturers. In those larger industries approaching the standard of heavy industries his status is emerging under the title of chemical engineers. This is particularly evident in the organic solvent industries which are expanding so rapidly in England now.

In the production of sugar—a subject on which I feel very much more at home—the status of the chemist has been stabilised in the Tate and Lyle factories for very many years, though in the Fairrie Refinery the chemist was a post-war innovation.

This innovation was considered necessary by the Fairrie directors in view of the fact that the quality of the Fairrie product was compulsorily debased as a wartime expedient. In consequence the operatives, drilled in four years of mediocrity, were unable, except by tedious and time consuming rule-of-thumb methods, to improve the quality and efficiency of the sugar; and time was an urgent factor.

Accordingly the services of Mr. A. Potter—now Technical Supervisor to the Liverpool combine of Tate & Lyle and Fairrie's—were obtained, and under his capable control the Fairrie fine sugars (the most beautiful I have seen) surpassed even the Tate sugars in grain and lustre, though the soft yellows were not so good. This was all the work of a chemist to whom rule-of-thumb methods and incomplete analysis were anathema.

The production of soft yellow sugars in itself is a strong argument for rigid chemical control of the factory. A very careful watch is kept on the ash, invert, colour, and water. This is essential for the production of a uniform quality of these sugars. A shift chemist is continually watching the yellows liquors on and off the char and working out the proportions of liquors for each pan. It is little wonder then that the manager, assistant manager, and shift superintendants were all chemists in their time.

The same state of affairs pertains in two beet sugar factories that I know, namely, Bury St. Edmunds and Peterborough—the two most efficient in England. These compare very favourably with the best in Europe.

In both these factories the figures from the laboratories are displayed on blackboards for the guidance of the shift superintendants, who are chemists, as are the factory superintendants, in the control of the draught on the beet cosettes, the

expression of waters from the exhausted cosettes, the functioning of the carbonation stations, and in fact the whole running of the factories.

A notable feature of both the beet factories and the refineries is the attention bestowed on the molasses massecuites. The drinking and the cooling were under direct control of the laboratory so that false graining might be eliminated and the exhaustion brought to an optimum. This of course is very necessary in the beet factories owing to the high ash content of beet with its consequent high melassigenic effect.

Thus we see that in England chemical control is regarded as essential, not as a figure factory, but the force that directs the factory.

In South Africa we see a less happy state of affairs. The usefulness of a chemist is not generally appreciated for, apart from sugar, there are not many large manufacturers, and the economic burden of a skilled professional man would tend to be too great for the strength of a small firm. Thus we get the vicious circle of insufficiency leading to inefficiency; the consumer complains of the variation in quality or lack of it in the local product, and the manufacturer has to close down or accept an amalgamation with an overseas firm.

Of the large companies I think we can take African Explosives & Industries as an example of the ideal state. It has long been realised by this firm, that they are producing chemicals, and that chemists are logically the men to supervise the production of them. The realisation led inevitably to the practice, and their works are administered by chemists, or men with chemical training.

Let us consider sugar manufacture. It is not generally realised that sugar production is a chemical industry, yet the fact is obvious. And are not carbonation, or defecation generally, filtration, and crystallisation physico-chemical reactions? Yet how many mill overseers have been chemists?

The shift chemist is often far too busy keeping abreast of his laboratory work to find time to attend chemical reactions in the factory, while the chief chemist cannot be on duty 24 hours a day without prejudice to his health. Besides, he is not always welcomed with open arms when he does wander farther from the laboratory than the bare collection of samples warrants. I believe that this attitude is disappearing, as in an efficient chemical industry it must.

In this connection I was interested to hear that there is a growing tendency to transfer the shift chemist after some years of experience to the factory as overseer. This is indeed a welcome step forward, and, when the wisdom of the step is generally appreciated, I think that this will become the standard practice. Only in this way can the factory attain that state of complete chemical control, that is so desirable in the interests of efficiency.

In a nut-shell then we see that the chemist in England has proved his usefulness not only in the laboratory but as a supervising officer, and it can be only a matter of time for this fact to be as widely appreciated in South Africa.



The PRESIDENT: I think we must congratulate Mr. Paul on his very interesting paper. It is gratifying to the Council, I am sure, to have some of the younger members coming forward with papers of this kind. Mr. Paul will be pleased to have any remarks or discussion on his paper.

Mr. MOBERLY: I am not going to ask any questions, but just to say a word of appreciation, because expressions of opinion like this are like a long cool drink in a desert. The chemist on the whole does not get very much appreciation, and it is nice to know there are those who will say a word for him.

Mr. Paul has made two remarks here: "Generally, however, these men graduated to works manager-ships in which positions they were generally eminently successful, because they were not, as is popularly supposed, incapable of anything but gazing in awful concentration at a test tube. But this is a superstition that is dying hard." Later on he says "While the superstition that outside his laboratory he is childlike in his simplicity and incapable of controlling men is so belied in practice, that no discussion is necessary. One wonders, though, about the origin of the superstition." I happened to be at a Board meeting the other day, in which I had occasion to make some comments which were not acceptable to the meeting, and one member got up and said that the trouble about chemists is that they get in a trance and they don't recognise L.s.d. when they see it. My reply to that was they didn't see it often enough. The superstition probably arose from the humorous tradition of the absent-minded professor and has persisted from that tradition, oblivious of the fact that the absent-minded college professor and the chemist in industry, although they both deal perhaps with the same science, are really not the same animal at all. But it is accepted as fact that the professor of chemistry occasionally goes out in his pyjamas because he has forgotten to dress in the morning, and that there is something in the scientific outlook which banishes a man from contact with the world. Mr. Paul has pointed out that that is not so. However, I think the superstition is dying. Even in our industry there has been in recent years a slow, grudging admission that the chemist has come to stay. In mentioning some of the industries in this country that have appreciated the value of the chemist, I think a word might have been said for the gold industry, where the work of the chemist is very well appreciated, and where the chemist gives a very good return for his salary.

These are the only remarks I have to make, and they are said by way of appreciation, and not in any way by way of discussion.

Mr. DODDS: Mr. Chairman, the prejudice against chemists which Mr. Paul and Mr. Moberly have alluded to is, I think, dying, even if we think sometimes it is dying rather hard. But there has been a considerable improvement in many industries. I saw a rather striking example of that the other day. There was an account, not many years ago, of a large steel works in America which had consented, under protest, to accept a chemist that was strongly urged upon them from headquarters. The manager wrote to say "If you must send us a chemist, please let us have one who is a good violinist; then he can play a useful part in our orchestra in the evenings and help to amuse us, and we will try and put up with his nonsense during the day time." However, I don't think you will find any steel plants in America to-day with that same feeling. In our own country we find, as an example, one of the largest chemical companies in the world—Imperial Chemical Industries—that chemists are almost invariably in the prominent administrative and controlling positions in that organisation.

Dr. HEDLEY: I also rise to register my appreciation of this paper. It is remarkable how difficult a thing it is to get people to appreciate in business value of the trained scientific man. During the war I sat on two boards of companies which were compelled by the British Government to employ chemists supplied by the War Office. I had a splendid opportunity therefore noting how difficult it was to convince the business man that part of the Board and a large part of his staff should contain scientific men in prominent positions. One of the companies prospered greatly and is now a star in the firmament of the Imperial Chemical Industries.

The Chairman, Sir Harry McGowan, of the latter combine, was in South Africa lately and told us all how important it was to have scientific men in the key positions. This speech, delivered in Johannesburg, was reported in all South African papers and issued as a pamphlet by the Associated Scientific

and Technical Societies of South Africa. I heard a business man say about it that "it was rot," utterly disregarding, consequently, the high position and authority on the subject of the lecturer. I doubt if there exists in South Africa a business position corresponding to that of Chairman of the Imperial Chemical Industries.

In the Javan Sugar Industry we have another excellent example of how trained men are regarded. In spite of having the cheapest labour in the world Java found that the most expensive Research Station in the Sugar World was well worth while. Moreover, when the recent bad times overtook Java they did not dismiss the expensive men they had but economised in every other way possible rather than lose the men they knew knew their jobs.

So much has been written and said on Mr. Paul's subject by people who have studied it that one could talk to the text all day, but there is one thing not realised properly. When chemists are blamed, by those who are not chemists, for not being a success the fault very often indeed for the non-success lies with the employer. Such blame is like cursing a golf club for topping a shot.

Those of you who know the Sugar Industry know however, that gradually the chemist is coming more into his own. The engineer is better off than the chemist, because the engineer has got the Government behind him. The Government insists on a qualified engineer being placed in charge of machinery when the horse power is a certain figure. The chemist has got no Government backing.

The PRESIDENT: No other remarks, gentlemen? Well, gentlemen, as I said before, we must congratulate one of our younger members in bringing a paper of such interest before the Congress. In my address to the Congress I mentioned the co-operation between the chemist and the engineer. I am glad Dr. Hedley brought in a little about the engineer. It has been a very interesting paper, and again I wish to congratulate Mr. Paul on it. I will ask you to join in a hearty vote of thanks to him.