'A CONSUMER'S APPRECIATION OF THE SYMPOSIUM'

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MR. CHAIRMAN AND GENTLEMEN,

I AM extremely grateful to Dr. B. R. Nijhawan for the opportunity given to me to speak to you today. It is indeed a great honour to me that I should be permitted to speak to this audience of specialists. But the only justification for this impudence of mine is that I have the privilege to be the metallurgist of a premier industry of this country — Praga Tools Corporation, Secunderabad. During the last three days, I have had the rare opportunity to listen to able expositions of the problems of industry; of course, presented in theoretical and scientific fashion. As I sat listening to those papers, especially those applicable to the processing industry, our own problems came to my mind and my own ideas crystallized into shape and I now go back with the satisfaction that our conclusions have now got the official, research workers' stamp of authority.

May I now refer in some details to the points that I would like to share with you? We have, in Praga Tools Corporation, a strange combination of equipment, very rarely found in this country. We have a very modern machine shop, a medium-size forging plant, a fairly well-equipped heat treatment shop, a useful metallurgical laboratory and a foundry which produces some of the best castings in this country with comparatively meagre equipment. I will not say that we have made anything spectacular, but we have been at least trying to make a scientific approach to our problems.

In our experience in the manufacture of railway rolling stock, in our forge and the heat treatment, the automobile parts and the machine tools, we have often come across an utter lack of uniformity in specifications for almost the same components. Let us take some standard parts like automobile valves. We have an order for about 60,000 numbers of these valves for various customers in India and we may be expected to speak with confidence on this subject. Each of the customers for whom we are making these valves is a firm of long standing and has its own preferences in specification. For instance, one customer insists on En 52 — 3·0-3·75 per cent silicon, 7·5-9·5 per cent chromium, 0·3-0·6 per cent manganese and 0·4-0·5 per cent carbon; a second firm calls for rigid adherence to En 59 — 1·75-2·25 per cent silicon, 19-20 per cent chromium, 1·15-1·65 per cent nickel and 0·74-0·84 per cent carbon; a third wants it to be made of the following compositions: carbon 0·4-0·5, chromium 23-24·5, nickel 4·5-5 per cent, manganese 1 per cent max., silicon 1 per cent max., molybdenum 2·5-3·0 per cent, sulphur and phosphorus 0·035 per cent max.; the fourth wishes to have the valves to be made of a simple high tensile steel, similar to En 25 to 26. There are some others who would not like any of these groups, but would like to have the softened austenitic steels — En 54 and En 55 types. Even among those who wish to have En 52, there are two groups of people with special tastes: one wants the entire body to be hardened to 250-300 B.H.N. and the stem part of it to be induction-hardened or flame-hardened to 550 B.H.N., and the other group wishes to have only the stem to be hardened. As a processing industry, we have no option in the matter and we have to attempt to get the material that the customer wants, and even if he wishes to have it in gold, we have to do so. But what affects us is that this change in composition affects the production technique. Our selling price of a valve ranges from Rs. 3-8-0 to Rs. 4-8-0 and the cost of material itself is approximately Re. 1 per piece. I cannot, of course, give you the details of our process layout without losing my job, but let us take the heat treatment alone. Flame-hardening of stem alone is a simple process, which could reach a production figure of 250-300 numbers per shift per oxy-acetylene torch worker. But, if I could have a 4 kW. induction heating equipment, I could reach an easy production of 8000 valves per shift for the same operation. It is obvious that the cost of production will go down considerably, but what interests us more today is the present market conditions and the question is whether we could afford the luxury of using our own specification. Since we happen to manufacture valves for most of the important manufacturers, I think I will be justified if I put the estimated target for 1956-57 at 2 lakhs of valves. If this is split up into various compositions and manufactured under different stages, I am afraid we will not go very far. It is, therefore, timely that Mr. Bucknall and Dr. Nijhawan have given a lead to the industry to arrive at some standard specification and conform to it.

I shall now refer to the discussion about the case-hardening steels, with particular reference to automobile parts and other jobs. The British Specifications group them as:

(i) Carbon case-hardening steels — 32 tons minimum tensile: En 32-A, 32-B, 32-M.

(ii) Carbon-manganese case-hardening steel — 40 tons min.: En 201 and 202.

(iii) Alloy case-hardening steels — 40 and 50 tons: En 33 (without chromium — 0·3 per cent max.), 34 and 37.

(iv) Alloy case-hardening steels — 55 tons min. tensile: En 35, 36, 325 (Ni-Cr types).

(v) Ni-Cr-Mo type — En 39-A, 39-B — 85 tons min.

It is very common experience in practice that in the absence of highly specialized giant-machine-tool manufacture, the need for the last type of Ni-Cr-Mo case-hardening steel is limited. The choice of material from among the remaining is mainly based on the section thickness, about which a very interesting paper was read yesterday. I would like to point out that the major use of these types of steels, which combine surface hardness and high tensile core, is in the manufacture of shafts — the crankshafts, spline-shafts, etc. I have my own doubts as to how far the abrasion-resistance properties of a steel could be equated with Brinell hardness figure. For instance, the high-manganese axle box liner is not very hard. So, I would suggest that for parts which are not complicated or delicate, the simple carbon-manganese type of case-hardening steel should replace other types. Where oil-hardening type of case-hardening steel is required, I would suggest the simple En 33 and similar types. But in my experience, sizes over 1 in. in En 33 cannot be successfully hardened in oil. Where, of course, high tensile strength is required, we have no option but to use the alloy case-hardening steels of higher strength. At this stage, I would like to point out that in the absence of indigenous supply of salts for the liquid carburizer, or the gas for the gas-carburizer, pack-carburizing with $BaCO_3$ and wood charcoal is still the most common procedure, and carburizing under these conditions is still a costly process. I am aware that the Indian Wild-Barfield, whose managing director spoke yesterday, have offered a very efficient gas-carburizer. But that presupposes a large quantity of jobs, and that again means standardization in specification. Also, with the coming in of the spheroidal graphite cast iron, with the advantages of easy castability, most of the small size crankshafts etc. will be switched over to the better type of alloy cast irons.

Speaking of specifications, my mind goes to an incident when Praga Tools Corporation had a strange experience. We are manufacturers of railway rolling stock. We were once called upon to make the coupling yokes and hook bolts in high-tensile steel — Ni-Cr-Mo type. But, later, we were surprised to see that the next order for the same job was called for in the medium-carbon 0·4 per cent I.R.S. class IV, heat-treated. That shows how the specifications could be changed. The need for a standardization and restriction of the types of steels to certain varieties will be felt much more if it is realized that in heat treatment batch quantities have assumed serious importance. Till yesterday, the iron-carbon diagram was the basis of heat treatment and any steels could be heated in any fashion and quenched in whatever medium one felt like doing consistent with hardness required. But today, the S-curve is the basis of operation in the salt baths and it would be impractical if there were no standard experimental data on the various types of composition. This, evidently, cannot be done unless types of compositions are restricted to basic types and exhaustive data prepared either by the manufacturers or the research institutions.

In these days of international participation or technical collaboration in Indian industry, a mass of specifications has come into the field and the intermediate producers like Praga Tools Corporation are often confronted with the problem of choosing the best alternative Indian specification for any other type of foreign specification. In the absence of a comprehensive picture of our steels, it is often difficult to correlate the specifications. Taking a very simple case, that of En 8 specifications, it will be widely agreed upon that I.R.S. class IV is the nearest approach to En 8. But, when it comes to a question of equating with En 8 Q, R, S, T, etc., the processing industry is faced with a problem — that of the ruling sections. For instance, a $\frac{7}{8}$ in. section of En 8 on normalizing will reach 40-45 tons/sq. in., but more than that size would require hardening and tempering. The question is whether I.R.S. class IV could be depended upon to produce same results.

Before concluding, I would just like to refer to two more points which were made in the various papers. One is about the high-speed steels. It should be realized that the tipped tools like the Widia tools have come to stay. Whereas the cutting speed with high-speed steel is about 60-80 ft. per minute, it is quite common to use 120-140 ft. per minute with the tipped tools. Even in the case of milling cutters, the inserted types of tipped tools will in future replace the high-speed steels. So it requires a very careful study.

Another point I would refer to is the stainless steel. I am not competent to say anything about the various statistics presented on our future requirements. But it is becoming more and more clear to us that the corrosion resistance properties of this steel alone, except in exceptional conditions of corrosive atmosphere, will not support this industry. We make the piston rods for the vacuum brake fittings for the railways. A stainless steel sleeve is fitted on to a low-carbon steel and given a fine finish on grinding. But it is a problem to get these tubes and the Pragas are experimenting with the possibility of suitably chromium-plating medium-carbon steel heat-treated to the required tensile strength. It may or may not succeed, but I wish to say that the problem is real and the National Metallurgical Laboratory is to be congratulated on the experiments with alternatives — I will not say, substitutes.

This symposium has indeed been very interesting to the non-research, matter-of-fact workers like me in the field of practical metallurgy and I now request the organizers of this symposium to accept the grateful thanks of our industry for the very clear, effective lead the National Metallurgical Laboratory has given under its very distinguished Director and the Deputy Director.