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a report covering Soviet production of machine tools with details on the Machine Tool Plant i/n Ordzhonikidze, Moscow, the Machine Tool Building Plant "Red Proletariat" i/n A.I. Yefremov, and ENIMS (Experimental Scientific Research Institute for Machine Tools), Moscow.

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26th April, 1962

U.S.S.R.

Economic/Scientific

Russian Production of Machine Tools

The Ordzhonikidze Factory

1. The factory is housed in old premises built by young people in 1932. The works are devoted in the main to the manufacture of transfer lines and unit heads. Unit heads are standardised in the Soviet Union and the claim has been made that any unit head of a given size can be interchanged with one made in a different works: the interchange necessitates a lot of packing pieces and washers.

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2. This works is suffering from the old-fashioned building and cramped conditions, and from the lack of modern machine tools.

a new Russian-built machine, which they designate a jig borer but which is more like a three-headed plano-miller, is just being installed. They claim to employ something in the region of 4,000 people and still have 750 of the men who started work there in 1932.

3. Affiliated to this factory is a technical school, technical laboratory and an apprentice training scheme. The total apprenticeship period is two years, one year theory, one year's work in the plant.

4. As in all other Russian factories, the output here is planned from year to year, the finalised programme being jointly drawn up by the Director of the works, the workers' representatives, the suppliers' representatives and the customers' representatives: and those plans have then to be approved by the local state planning committee. These one-year plans are of course part of a larger seven-year plan which is said to be running ahead of schedule and which originally planned an increase of 80% in industrial production over a seven year period but which has now been adjusted to 100%.

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5. A bonus of up to 40% can be earned by workers, technicians and the director if the planned output is exceeded, and it is only in exceptional circumstances that this bonus is not paid. [redacted] 50X1-HUM [redacted] as the production methods employed are most conventional - in fact, at this particular works, rather poor - one can only assume that the agreed target is not set particularly high.

The Lathe Factory known as Krasnaya Proletariya (Red Proletariat).

6. This factory employs some 6,000 people, and is 25 years old. It manufactures all kinds of lathes, from small centre lathes to large wheel turning lathes, chucking and copying machines, etc., as well as an eight spindle vertical automatic; but the outstanding feature of this plant is the mass production of fifty model No. K.62 Lathes per day (totalling some 12,000 to 12,500 per annum) approximately 8" centre height and 40" between centres. This machine appears to be a good modern lathe, having 24 spindle speeds up to 2,000 r.p.m. (3,000 optional), 48 feeds for cross slide and saddle and rapid traverse to carriage and saddle by push button incorporated in directional control joystick. The machine looks rugged and is driven by a 10 kilowatt motor, a separate motor fitted to the end of the lathe bed being used for the rapid motions. The machine is sold complete with coolant pump and piping, tray and electrical equipment.

7. There are no unusual manufacturing processes to be seen; except that multi-spindle drill heads and transfer lines are being used for making lathes rather than, for instance, diesel engines; and it is only possible for the Russians to do this because they have a guaranteed market for their machines. An interesting feature is that the lathe bed (which can be supplied in various lengths apart from the standard machine length) is milled and not planed, using a plano-milling machine with a horizontal bridge type cutter bar employing some six cutters and milling cutters fitted to the side heads below the cutter head. Flame hardening is

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considered old fashioned, the Russians claiming to have had much better results with the induction hardening they are now using. Another feature is the fact that cross slide, saddle ways and bed ways are ground, using in each case cup wheels. The finish obtained is quite rough, as can be felt when passing one's fingernail over the surface, but this is probably done on purpose to avoid "stiction" problems resulting from having one ground machine member sliding over another.

8. Three shifts are employed at this works. Two are production shifts and the third one a changeover shift. Two production lines, one for making gears and the other for spline shafts are operating as follows:

(i) The gear line is fully automated and starts with a forged blank which is broached, turned on one side, moved to another machine, turned on the other side and moved to the next machine where the face is turned. A further machine carries out the gear cutting, another the gear tooth rounding and another the shaving of the gear, from where it is picked up automatically and stacked. This line, using the same machines and the same work-holding and automation equipment, is designed to manufacture any of the gears used in this lathe. The automation equipment is extremely simple and sometimes a little crude, but it works extremely well.

(ii) The other line, namely the spline-shaft line, is perhaps more interesting. It will handle any one of 27 or 28 different spline shafts used on the mass-produced lathe and by other lathes manufactured in the factory. Thus, one day's production secures one month's supply of any one particular shaft. These shafts vary from approximately 8" to 26" in length. Some require cylindrical grinding of journals at one end and some at both ends, and yet the same machine line is used to cover the tremendous variation in type and size of spline shaft.

The third shift is responsible for the changeover.

9. It is claimed that the total labour hours used for building the lathes is under 200, and that this includes not only painting but the hours used at the foundry.

10. On completion of the headstock assembly, the headstock is tested for noise, spindle run out, spindle parallel to base, etc., while it is on a moving band prior to assembly to the bed. The assembly of the headstock to the bed is also carried out on a moving band and so are all other inspection operations which are considered necessary. Inspection seems to be cursory. Periodically a machine is pulled out of the line for a screw to be cut and the cut screw tested in the laboratory, where the facilities are only just adequate.

11. The general impression gained when walking through these works is one of extremely poor plant maintenance. Inspection room equipment is [redacted] in most cases fairly 50X1-HUM old.

E.N.I.M.S.

12. This Institute is not very much concerned with pure research, but mainly carries out development work. Apart from developing machines, they seem to be producing not only prototypes, but at a further stage pre-production batches of six or more machines of one kind. The Institute has been responsible for developing the famous Russian spark erosion machines, using 100 kilowatt equipment. It would appear that for finishing operations their machine is no more productive than anybody else's, but they claim that for roughing operations their metal removing rate is eight times that of any Western machine. On the other hand the finish obtained by this machine is exceedingly rough and this may be largely due to the lack of good filtration equipment for their electrolyte.

13. The Russians find graphite far more suitable than copper, brass, steel or aluminium for making electrodes. They claim that the wear on the electrodes made from graphite is considerably less than on those made from other materials. In addition it can be shaped and machined very easily, [redacted] even..... 50X1-HUM

or even moulded from a wooden pattern.

14. Another machine which they have developed is a gear rolling machine. This produces gears of the accuracy required for tractors, but not better. It is, however, a very fast operation and owing to the favourable grain structure and compacting of metal achieved, the gears produced on these machines are very satisfactory in use. They employ two machines, one at which the blank is induction-heated and the rolling takes place in the hot condition, and a second machine for finishing rolling by cold operation.

15. Another machine developed at this Institute is a tape controlled face cam milling machine. This would seem an interesting exercise, but of very limited application.

16. A further development which has come out of this Institute is a spline shaving machine. The tooling for this requires very great accuracy in making and consists of a holder with sliding cutters corresponding to the number of splines which are cam operated by a ring shrouding the whole assembly.

17. A further development to be seen is a machine, or rather a fixture, for gear tooth rounding, at which both sides of a gear tooth are rounded simultaneously.

18. They also produce gear grinding machines using a multi-ribbed wheel mounted on a horizontal spindle, reciprocating vertically but moving horizontally with the speed of the gear rotation, thus using the generating principle, over a few feet at a time.

19. Other new machines to be seen there are the prototypes of ultrasonic machines, using 4 kilowatts, and plunge cylindrical grinding machines of a very low construction (to reduce vibration) where the workpieces are mounted between centres above the grinding wheel. They claim (and it appears to be true) that this facilitates automatic loading. They are also manufacturing automatic dynamic balancing machines to be incorporated into transfer lines.

20. Another interesting machine is an internal grinding machine of the vertical type, where they employ a separate spindle for roughing and another for finish grinding, claiming that this increases the speed of production because it is possible to use the correct grade of wheel for the roughing and the correct grade of wheel for the finishing.

21. The Institute is responsible for the testing of foreign machine tools, and repeat orders for machine tools depend on their favourable report. It is also responsible for vetting and approving the design of machine tools designed anywhere in the Soviet Union. In other words, no Russian machine tool works can go ahead with a new machine unless it has first been approved by ENIMS.

22. The head of ENIMS states that there are approximately 2,000,000 general purpose machine tools in the Soviet Union: that their present output of machine tools is in the region of 120,000 per annum, and that they will have reached a production of 220,000 machine tools in five years' time.

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[redacted] Comment: 50X1-HUM

[redacted] para. 3. Two years is a very short period indeed, and to some extent minimises the value of figures one reads from time to time relating to the vast numbers of technically trained personnel available in the Soviet Union.

para 9. 200 hours does not seem to be a very low figure considering the high degree of mechanisation.

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