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INDUSTRIAL REPORT:

PLOUGH PARTS PRODUCTION AT UBUNGO FARM IMPLEMENTS MANUFACTURING COMPANY LTD.

By: F.P.L. Kavishe*

1. Introduction

Ubungo Farm Implements (UFI) was established in 1969 as a result of an 8 million Tanzanian Shillings interest free loan from the Peoples' Republic of China. Actual production started in March 1970, when 274,148 hoes and 3,100 ploughs were produced. It is located in Ubungo area, some 11 Km from the Dar es Salaam city centre and its premises consist of an administration block, two workshops, a workers' canteen, a poultry farm, and a residential area for some Chinese experts who work hard with the workers at the factory.

2. Manpower

UFI is a member of the NDC (National Development Corporation) group of companies. Its General Manager who is responsible to the Board of Directors of the NDC is assisted by a Production Manager, Personal Manager, Marketing Manager and a Chief Accountant, all of whom are Tanzanians with the exception of the Chief Accountant who comes from Pakistan. The post of an Engineer is yet to be filled, although the Production Manager is an Engineer by profession. The factory needs a Mechanical Engineer for designing and maintenance and an Electrical Engineer. The Chinese experts who include an engineer and five technicians are finishing their contracts this year, and might leave soon. At present there are four Tanzanian technicians; one responsible for maintenance, one for workshop No.1, one for workshop No.2 and a laboratory technician. These work in their respective places and are assisted by supervisors in each section.

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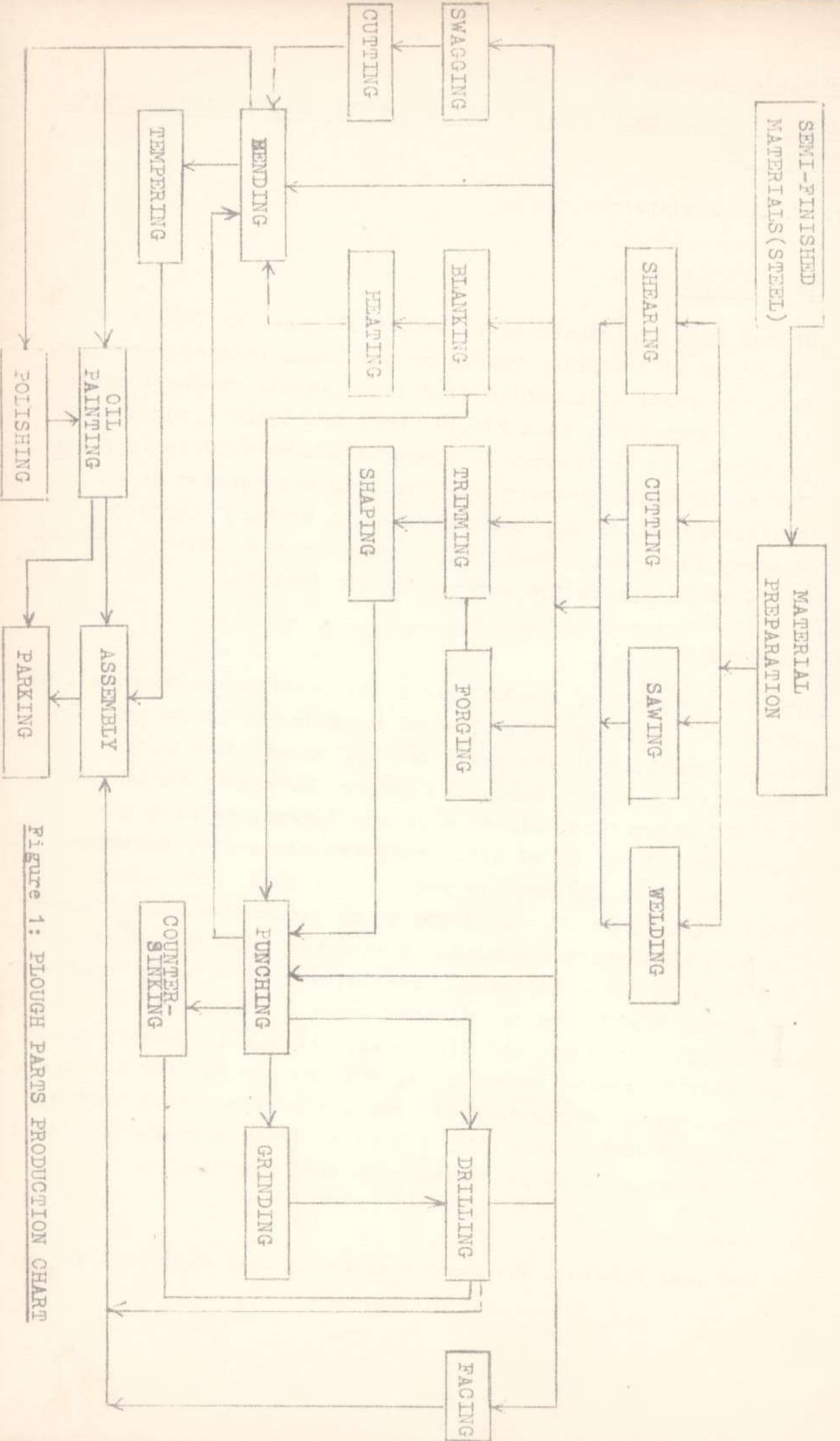


Figure 1: PLOUGH PARTS PRODUCTION CHART

In each section there are skilled workers who are machine operators and alongside these, there are semi-skilled workers. Most of the workers involved in production are trained on the job and as they gain experience, they are graded at the Chang'ombe Trade Testing Centre. Payment to these is therefore according to the salary scales issued this year. The unskilled workers at the minimum salary scale do such works as loading and unloading trucks, transportation of semi-finished products general cleaning, etc. The combined effort of the manpower is responsible for manufacture of farm implements like ploughs, hoes, axes, grass slashers, groundnut shellers, etc.

This report deals with the production of plough parts:

3. Material Preparation

The plough has 32 main parts (see figure 2) all of which follow more or less the same line of production, as shown in Figure 1. Production starts with the raw steel which is imported from China. It comes under different specification ranging from low carbon steels to alloy and high speed steels, the full list of which is given in the Appendix. One tone of general purpose steel costs about 3,000/- Tz.Shs. The main plough parts include among others, the mould boards, plough blades (shares), handles, beam, frog, braces, wheel, farrow plates, landslide, heels, devis, wheel shark, bolts, hooks, and spanner. The production of any of these starts in the material preparation workshop where pieces are cut into specified dimensions before being machined. In this section there is a machine with the specification J 11-100 which is used to cut flat bars to make such parts like shares and handles. Steel sheets are sheared by a Guillotine Shearing Machine (QA 11- 13 x 2500) to make parts like frogs and mould-boards. Alloy steels which come as round bars are cut into pieces by the G 72 Power Hack Saw, and these are used for repair works and for the manufacture of dies. Another machine in this section is the J 53-60 double disk friction press used for bending and rivetting. More information about these machines is given in the table below.

SOME OF THE MACHINES USED AT UPI

SPECIFICATIONS	NAME	WEIGHT (TONS)	MOTOR POWER (KW)	NOMINAL PRESSURE (TONS)	FUNCTIONS
J 11 - 100	Inclinable Cutting Machine	6.5	7	100	Cutting flat bars
QA 11-13 x 2500	Guillotine Shear	13.3	28	250	Shearing steel sheets
G 72	Power Hae Saw	-	4.5	-	Cutting round bars
J 53 - 60	Double Disk Presser	-	4.5	60	Bending, rivetting
J 23 - 100	Inclinable Puncher	-	10	100	Punching, bending, cutting, trimming
JA 31 - 250A	Single Point Presser	25.4	28	250	Blanking, punching, trimming
J 53 - 300	Double Disk Presser	-	22	300	Bending
J 53 - 160	Double Disk Presser	8.4	10	160	Bending, stamping hoes
D 43 - 630	Duplex Rolling Machine	-	-	-	Rolling hoe blanks
C 41 - 150	Pneumatic Hammer	-	-	150	Forging (spare parts, dies, heel)
C 41 - 400	Pneumatic Hammer	-	-	400	Forging

4. Further Machining Operations

After cutting, the pieces are transported by a trolley to the second part of the material preparation workshop, referred to as workshop No. 1, for either blanking, trimming, forging, punching, drilling or bending

4.1 Mould Boards

Pieces to make mould boards which are cut No. 45 steel sheets are sent to the single Point Press Machine JA 31-250A for blanking operation. This is one of the largest and heaviest machines in the factory. The machine specifications as well as the steel specifications are according to Chinese standards. The Single Point Press can also be used for punching or trimming when the appropriate die is used. Three workers operating this machine can blank up to 1,600 mould board pieces per shift (8 hours) after which the pieces are transferred to the J 23 - 100 Inclinable Punching Machine for hot punching. Heating process is done in oil burners which use diesel as fuel. These consume about 3,000 gallons of diesel per month. Two operators at the Punching Machine punch about 1,200 per shift after which the pieces are sent to a drilling machine (Z 525) for counter-sinking, and then to the J 53 - 300 Double Disk Friction Press for hot bending. The name is derived from the fact that the machine consists of two friction disks that are driven by an electric motor through a belt pulley. The double disks drive a horizontal flywheel due to contact friction and this in turn drives the main screw of the machine which is connected to the slider holding a die. By changing the die different operations can be performed in this machine. From this machine the pieces (about 1,200 per shift) are transferred to the M 413 P polishing machines. After polishing the mould boards are oil painted and then sent to the assembly section.

ANIMAL - DRAWN SINGLE FURROW PLOUGHS

A good general purpose plough, constructed to give maximum strength with lightness in weight. Available in 8", 10" and 12" models. Flat and Upset Heat-treated Shares.

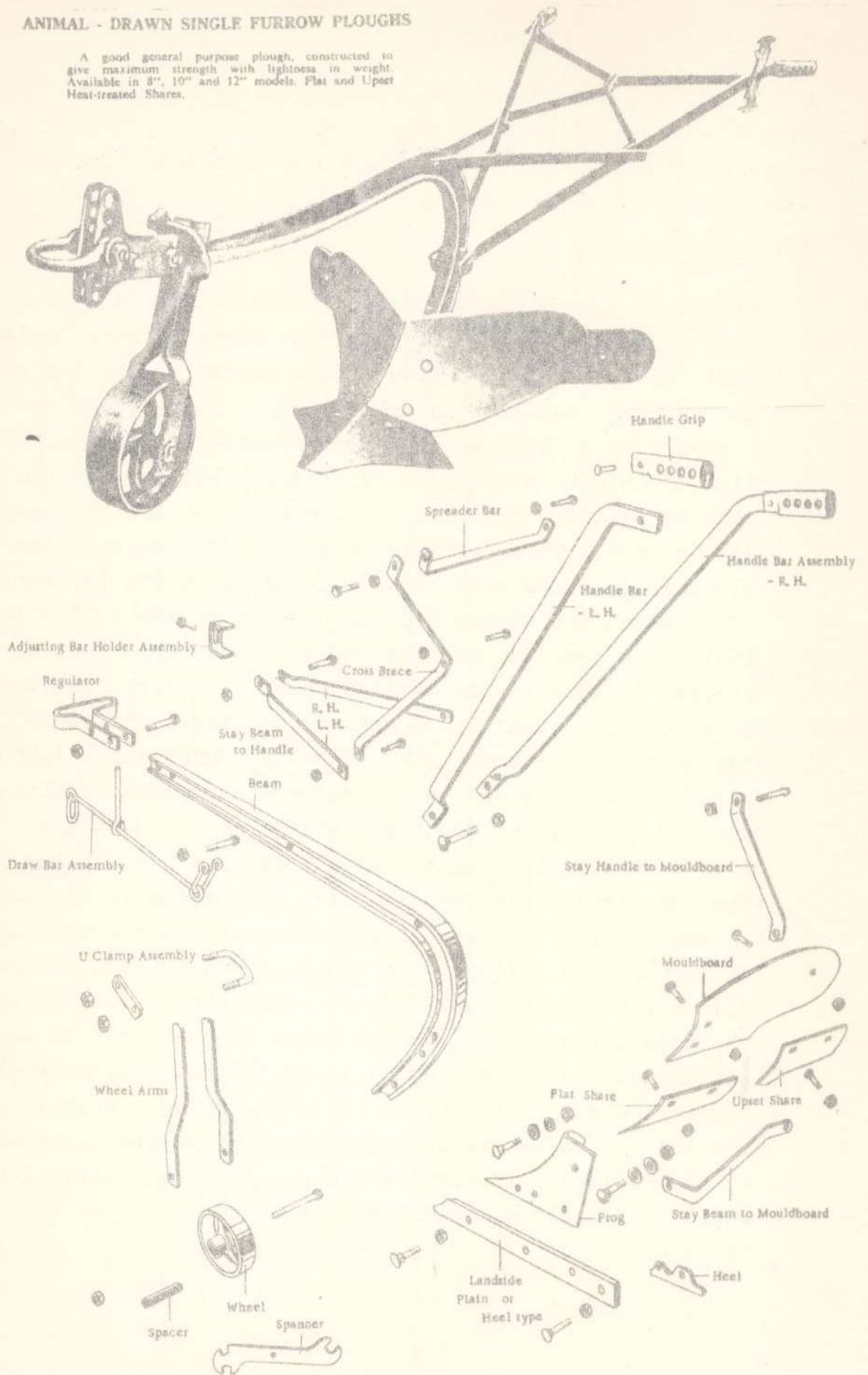


Figure 2: MAIN PARTS OF THE PLOUGH

4.2 Heels and Handles

Pieces for these are sent to the forging section where there are oil burners and two pneumatic hammers for forging. From here the pieces are trimmed into the required shape by the inclinable machine. Shaping follows in the B 665 Shaping Machine and then hole punching is done in J 23-100 inclinable machine. Two workers punch up to 2,400 heels after which they are sent to the painting section. Handle pieces are sent to the drilling machine after cutting where some holes are drilled. After this they are bent in the friction press and then oil painted.

4.3 Ploughs Blades (Shares)

Both the upset and flat shares are made from No. 6 Mn steel which due to its high Manganese content has a spring like characteristic. The process consists of bending, punching, counter-sinking, oil painting and then assembly or packing.

5. Communication

The method of transmitting information is either verbal or in written form. There are no technical drawings that accompany the semi-finished products in the production line since each operation is performed by a die which immediately produces the required shape of a workpiece. Technicians and supervisors are each provided with plough parts operational process forms which indicate each stage of operation for the production of an item. Technical drawings of these parts are available for checking only, and so most of the workers in this section can do their work properly without even knowing how to interpret technical drawings. But all the workers in workshop No.2 which is involved in the manufacture of spare parts and dies must understand drawings which are widely used in this workshop.

6. Auxiliary Materials, Wastes and Power

Some components used in the production include bolts, nuts and cast iron wheels. These together with a limited number of spare parts which cannot be manufactured at the factory are imported from China from where all the machines were bought.

Oil paint (green and black) is also imported from China although sometimes it is bought from Dar es Salaam. The time of delivery of these, together with that of raw steel is sometimes up to two years and so it delays production in those cases. There are no by-products in the production of plough parts, but wastes are common. In making one plough (which weighs 31 kg) about 12 kg of steel are wasted as scrap. So far the scrap metal is not being used but a committee is already working on the question of its utilization. The main source of energy in the factory is electricity supplied from Ubungo Power Plant. About Shs. 10,000/- is allocated for electricity bill per month while Shs. 6,000/- is for water bills. Water is used in production as a coolant and as a quenching medium in the heat treatment process.

7. Maintenance

Most of the machines in the production line were made in 1967 or 1968. Since production started they have been subject to ordinary repairs and maintenance, and it is only in March this year when overhauling was done. The type of maintenance has been breakdown maintenance so far, but there are plans to introduce periodic servicing.

Industrial safety is an important issue in a factory like this one where many machines are present. Safety regulations are explained to each worker, and these are posted in each workshop for personal observation. A dispensary at the factory offers services to all employees without payments.

8. Conclusion

Apart from relating theory and practice in the Industrial training, we took advantage to study industrial life and factory organisation from the technical and social points of view. At the end of our training we wrote a letter of appreciation to the General Manager and made some comments and suggestions which are summarized below:-

- 1) Workpieces and raw materials are stored outside the workshops without care. These need shelter to avoid wearing by rusting.

- 2) Production of any item should go to the final stage of production to avoid overcrowding in the workshops.
- 3) Training for workers is well organised at the factory. This includes adult education, technical classes and political education.
- 4) Suggestions for sports and cultural activities for the workers were not being implemented fully. Only the football team was active.
- 5) The canteen offers tea, lunch and supper for the workers at reasonable rates. Some improvements could be done in cleanliness.

Acknowledgements

My utmost appreciations go to the UFI community for the good time we had together throughout our stay at the factory. My acknowledgements also go to the Organizers of the Industrial Training at the Faculty of Engineering, University of Dar es Salaam.

APPENDIX: CHEMICAL CONSTITUTION OF THE STEELS AT UPI

STEEL NO.	C	Si	Mn	Cr	V	Ni	Mo	S	P	Ni	Remarks
A3	0.14-0.22	0.12-0.30	0.40-0.65	-	-	-	-	0.055	0.045	-	General Steel
10	0.07-0.14	0.17-0.37	0.35-0.65	0.15	-	-	-	0.045	0.040	0.25	HIGH QUALITY
45	0.42-0.49	0.17-0.37	0.50-0.80	0.25	-	-	-	0.045	0.040	0.25	CARBON STRUCTURAL STEELS
65 Mn	0.62-0.70	0.17-0.37	0.90-1.20	0.25	-	-	-	0.045	0.030	0.25	STEELS
T7A	0.65-0.74	0.15-0.30	0.15-0.30	-	-	-	-	0.020	0.030	-	Carbon
T8A	0.75-0.84	0.15-0.30	0.15-0.30	-	-	-	-	0.020	0.030	-	Tool
T10A	0.95-1.04	0.15-0.30	0.15-0.30	-	-	-	-	0.020	0.030	-	Steels
16 Mn	0.12-0.20	0.40-0.60	1.30-1.60	-	-	-	-	0.020	0.045	-	Low Alloyed Structural Steel
8G4V	0.70-0.80	0.40	0.40	3.80-4.40	17.5-19.0	1.0-1.40	0.30	0.030	0.030	-	High Speed Steel
Cr12	2.00-2.30	0.35	0.40	11.50-13.00	-	-	-	0.030	0.030	-	
12Mo V	1.45-1.70	0.35	0.40	11.00-12.50	-	0.15-0.30	0.40-0.60	0.030	0.030	-	ALLOY
CrMnMo	0.50-0.60	1.20-1.60	0.25-0.60	0.60-0.90	-	-	0.15-0.30	0.030	0.030	-	DIE
CrNiMo	0.50-0.60	0.50-0.80	0.35	0.50-0.80	-	-	0.15-0.30	0.030	0.030	1.40-1.80	STEELS
Cr2W8V	0.30-0.40	0.70-0.40	0.35	2.20-2.70	7.5-9.00	0.20-0.50	-	0.030	0.030	-	