OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

19826

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Workshop on Steel Plant and Rolling Mill Rehabilitation

Nairobi, Kenya, 15 - 18 July 1991

PROCEEDINGS*

June 1992

* Mention of company names and commercial products does not imply the endorsement of UNIDO.

This document has not been edited.

I. Background Information

The Preferential Trade Area for Eastern and Southern African States intensified its efforts to develop its iron and steel industry and other metallurgical industries to provide a firm basis for the overall industrial and economic development of the area. In line with the above, the Zimbabwe Iron and Steel Company (ZISCO) has expansion plants and several mills plan additional plants and equipment for the near future and, finally, the commissioning of a sponge iron plant within the sub-region is also under consideration. Whilst the ZISCO plant operates at an adequate level of technology, the numerous other small steel plant rolling mills and re-rolling mills are, without exception, operating with substandard equipment and with a low level of technology, process and quality control as well as inadequately trained personnel. Thus rehabilitation of existing iron and steel plants and rolling mills of the region is considered an urgent priority.

A number of steps have already been taken to improve the current situation. The main initiative has been taken by the Iron and Steel Committee of the PTA which is planning the overall development of the sector. UNIDO has also assisted the Committee and the following activities have been carried out:

A long-term study, up to the year 1995, has been made by UNIDO of the supply and demand pattern for various steel products in each of the PTA countries. The results of this study will be most useful for the short and long-term planning needed to develop this sector.

UNIDO, together with the Commonwealth Secretariat, has made in-depth technological evaluation of the small steel plant/rolling mills and the re-rolling mills in the PTA countries. UNIDO hired consultants form ZISCOSTEEL whilst the Commonwealth Secretariat employed an independent firm and consultants. The output of these projects is some 12 in-depth analyses of the region's existing steel plants and rolling mills. Technical assistance, new equipment as well as on-the-job training and longer term institutional training has been recommended.

Training programmes are organized by UNIDO in co-operation with ZISCOSTEEL and the PTA Secretariat to upgrade the technical expertise of the metallurgical personnel in the PTA countries.

In the frame of the UNIDO project DP/RAF/88/072, a team of Czechoslovakian experts visited several steel plants in Kenya, Mauritius, Mozambique, Tanzania and Zimbabwe. The team provided direct technical advisory services and prepared recommendations for the technological upgrading of seven rolling mills. Some high priority instruments and tools were also procured through the project.

The Austrian Government has provided financial support to implement a project for the rehabilitation of the Kenya Rolmill Limited. The project US/RAF/88/263 "Rehabilitation of selected Steel Plants in the PTA Sub-region" provided high-level Austrian expertise, equipment and measuring instruments to the Company. On-the-job training and a study tour to Voest-Alpine was also undertaken. At the end of the project tangible results can be observed. The production capacity and product quality have been increased. The scrap preparation and maintenance processes have been enhanced. The energy consumption and

production costs have been de reased.

The project can serve as a model for the rehabilitation of steel plants and rolling mills of the region. For the dissemination of information given by the Austrian experts to the PTA, it was decided by the donor country, UNIDO and the PTA Secretariat, to organize a workshop on steel plant rehabilitation in Nairobi, where Rolmill Kenya is situated.

II. Participation in the Workshop

The participants were all executives from the respective mini steel plants or re-rollers of the region. Their active participation in and contributions to the discussions were indirect proof of the need for such a Workshop. The following countries were represented in the Workshop: *Angola, Kenya, Mauritius, Mozambique, Uganda, United Republic of Tanzania, Zimbabwe.*

UNIDO was represented with one staff member and 3 consultants, the PTA was represented through 3 staff members. Austria as past and possible future donor country sent one representative. The list of participants is included in Annex 1.

III. Objectives of the Workshop

The aim of the Workshop was to demonstrate the methodology of implementation, inputs and outputs of a steel plant rehabilitation project on the example of Rolmill Kenya Limited. Through the Workshop rapid and effective dissemination of information was facilitated.

Furthermore, the Workshop provided a forum for the discussion of existing steel plant and rolling mill rehabilitation problems, their financial implications and related technical questions.

IV. Deliberations of the Workshop

The Workshop adopted the following agenda:

1. Opening of the Workshop

2. Election of the Bureau

3. Adoption of the Agenda

4. Status Report on Development and Rationalization of Selected Small Scale Steel Plants in the PTA sub-region

5. Country or plant reports on rehabilitation prog.ammes

6. Rolmil Kenya Limited - Rehabilitation Project

7. Technological questions related to the rehabilitation process of steel plants/rolling mills:

   (a) Technological aspects of improvement programme at EAF plants

   (b) Role of maintenance and technical services for steel plants and rolling mills

   (c) Feasibility aspects of rehabilitation on programmes in an EAF steel melting shop

8. Any other business

9. Adoption of the report and closure of the Workshop

Opening of the Workshop

The Workshop was officially opened by Mr. G. H. Okello, Director of Industries in the Ministry of Industry of the Republic of Kenya. Statements followed by representatives of the PTA, the Austrian Government and UNIDO. The opening speeches of Mr. Okello, Kenya and Mr. Mwencha, PTA Secretariat are contained in Annexes 2 and 3.

Election of Bureau

The Workshop unanimously elected the following Bureau:

Chairman: Mr. Daniel O. Ogolla (Kenya)
Rapporteur: Mr. Vishwamber Gopauloo (Mauritius)

Presentation of papers

In line with the agenda, the following papers were presented to the Workshop

1. Report on the state of the art of selected steel plants of the region, and recommendations on rehabilitation, presented by UNIDO consultant Mr. Rudolf Stefec (CSFR) - Annex 4;

2. Introduction to Rolmil Kenya Limited, by Mr. B.S. Prasad, Manager - Annex 5;

3. Report on Kenya United Steel Company Ltd. (KUSCO), presented by Mr. U.K. Ghosh, General Manager, Development- Annex 6;

4. Report on the status of the iron and steel industry in Angola, by Mr. Kinlongo Kisakemwa, Maintenance Manager, Pipe Plant - Annex 7;

5. Steel plant rehabilitation in Mauritius, presented by Mr. V. Gopauloo,

Assistant Factory Engineer, Sections Rolling Limited - Annex 8;

6. Report on Companhia Siderurgica de Mocambique (Ltd) - Ex-Cifel, by T.M. Senzani-Chicogo, Director General of Metallurgy, Ministry of Industry and Energy - Annex 9;

7. Rehabilitation programme for Steelcast Plant (A Division of Aluminium Africa Ltd.), Dar-es-Salaam, Tanzania, presented by Mr. Sovello A.A. Mgani, Deputy Works Manager - Annex 10;

8. Report on the Rehabilitation of East African Steel Corporation Limited (Uganda), presented by William Tsimwa Muhairwe, General Manager - Annex 11;

9. Brief Report on the Rehabilitation of ZISCO, Zimbabwe, by Mr. Van Rensburg, Manager - Annex 12;

10. Consideration of technological questions related to the rehabilitation process and maintenance of steel plants/rolling mills - Presentation by UNIDO consultants Messrs. Richter and Scherrer from Voest-Alpine, Austria, based on experiences gained during execution of a plant improvement plan at Rolmil, Kenya - Annex 13. Due to technical reasons of reproduction this Annex is available only as a separate document.

V. Conclusions and Recommendations

The Workshop made the following recommendations:

(a) Policy and General Issues

1. The Report of the Workshop should be submitted to the Council of Ministers through the Committee on Industrial Co-operation.

2. An inventory of available raw materials and metallurgical products in the sub-region, e.g. coke. refractory materials, scrap, etc. should be prepared and distributed to the steel plants in the sub-region.

3. Assistance should be provided to some countries for installation and commissioning of equipment already delivered to their plants including the assessment of the viability of the projects before installation of equipment (e.g. KUSCO in Kenya and EASCO in Uganda).

4. Implementation of a comprehensive pricing study of steel products in the PTA countries and comparison with international market prices with the aim to establish a permanent information system.

5. A master plan for the establishment of scrap collection, processing and marketing networks should be prepared and this network should be expeditiously implemented by the member states.

6. A policy framework on export and import of scrap should be formulated by the member states in view of the severe shortage of this important commodity in various countries.

7. In view of the strategic importance of the iron and steel industry, member states of PTA should seriously consider giving preferential energy tariff rates to steel plants and rolling mills as major consumers of energy.

8. An agreement should be reached on a general system of setting PTA priorities in the iron and steel industry.

9. Special consideration should be given to Angola and Mozambique to assist them in the recovery of their metallurgical industries.

(b) Iron and Steel Production

1. The recommendations of the consultants should be implemented to the maximum extent possible by the companies that benefitted from the projects DP/RAF/88/072 and US/RAF/88/263.

2. Efforts should be made to increase crude steel production through the rehabilitation and rationalization of existing steel plants and the establishment of new plants where deemed necessary.

3. The EAF technology should be improved, e.g. through introduction of foamy slag process with the aim of reducing energy and refractories consumption. In the same manner, the rolling mill technology should be upgraded. This will include technical assistance in the form of in-plant training.

4. Implementation of energy conservation measures in the billet pre-heating furnaces, combustion and temperature control as well as installation of heat recuperators.

5. Implementation of a programme to enhance the life of equipment in steel plants by controlling the quality of water used for cooling through, for example, the use of a closed circuit system.

6. All efforts should be made to establish production facilities for refractories in the sub-region based on available raw materials.

7. To supplement scrap as feedstock for meltshops and development of direct reduced iron should be vigorously pursued through joint efforts of member states or private companies.

(c) Institutional

1. UNIDO should prepare the proceedings of the Workshop and send sufficient copies to the PTA Secretariat for distribution. This would serve as a guideline for steel plant and

rolling mill rehabilitation.

2. A PTA Steel Makers' Association should be formed. It would help to exchange technical information through newsletters or journals, conferences, personal contacts, etc.

3. Implementation, as a matter of urgency, of the establishment of the PTA Metallurgical Technology Centre which will in turn provide solutions to many of the problems identified by the participants, particularly in technical and consultancy services as well as training needs.

(d) Training and Transfer of Know-how/Technology

1. A sub-regional staff exchange programme should be implemented. It should involve as many steel plants of the sub-region as possible.

2. The Rolmill Kenya Limited project should be used as a model and basis for the illustration of the rehabilitation process, particularly in the areas of EAF practice (e.g. foamy slag technology) and rolling mill upgrading.

3. A Workshop on Computer Assisted Modelling of steel works and processing industries should be organized. The modelling package should be acquired for PTA and the workshop participants.

4. Member states should put more efforts in training of high calibre personnel in the metallurgical field.

5. Participants of training and study tours programmes should visit plants of similar magnitude and complexity in the industrialized countries.

6. Regular workshops on steel plant rehabilitation should be convened utilizing to the maximum extent possible local resources.

(e) Support Services

1. Developing the capacity for production of spare parts through strengthening or establishing heat treatment and forging facilities as well as the required engineering know-how taking into account the existing facilities in the sub-region.

2. In order to estimate the needs for forging and heat treatment all existing steel plants in the sub-region should provide their spare parts requirements and engineering facilities within their establishments to the PTA Secretariat preferably before 30 November 1991.

3. Introduction of up-to-date maintenance systems and technology and design of tailor made training methods/models.

4. Making better use of existing quality control laboratories to improve the quality of steel products in the sub-region.

ANNEX 1

LIST OF PARTICIPANTS

ANGOLA

Mr. Kinlongo Kisakenua, Maintenance Manager, Pipe Plant of Angola, C.P. 10409 - Luanda - R.P.A.

KENYA

Mr. Gilbert H. Okello, Director of Industries, Ministry of Industry, P.O. Box 30418, Nairobi

Mr. Zachary N. Mwaura, Senior Economist/PTA Co-ordinator, Ministry of Planning and National Development, P.O. Box 30005, Nairobi

Mr. George Ndegwa, Planning Officer, P.O. Box 61202, Nairobi

Mr. David Giteya Magwaro, Senior Industrial Development Officer, Ministry of Industry, P.O. Box 30418, Nairobi

Mr. Daniel O. Ogolla, Engineer I, Ministry of Industry, P.O. Box 30418, Nairobi

Mr. Fred K. Mungai, Engineer I, Ministry of Industry, P.C. Box 30418, Nairobi

Mr. Othieno Ochieng Louis, Assistant Engineer, Ministry of Industry, P.O. Box 30418, Nairobi

Mr. William Anyika, Assistant Engineer, Ministry of Industry,P. O. Box 30418, Nairobi

Mr. Julius N. Muchiri, Assistant Engineer, Ministry of Industry, P.O. Box 30418, Nairobi

Mr. Julius Njagi Gachoki, Assistant Engineer, Ministry of Industry, P.O. Box 30418, Nairobi

Mr. David Mutitu Kamau, Assistant Engineer, Ministry of Industry, P.O. Box 30418, Nairobi

Mr. I.H. Rizvi, General Manager, Special Steel Mills Limited, P.O. Box 30130, Nairobi

Mr. Utpal Kumar Ghosh, General Manager, Development, Kenya United Steel Co., Ltd., P.O. Box 90550, Mombassa

Mr. B.S. Prasad, Manager, Rolmill (K) Limited, P.O. Box 48662, Telex 24150, Fax 254-2-553674/555119, Nairobi

Mr. M.S.G. Prakasam, Works Manager, Special Steel Mills Limited, P.O. Box 30130, Nairobi

Mr. E.T. Muriuki, Principal Standards Officer (Mechanical Engineer) Kenya Bureau of Standards, P.O. Box 54974, Nairobi

KENYA (cont'd)

Mr. Gedeon Ngunyi Gatimi, Senior Standards Officer, Kenya Bureau of Standards, P.O. Box 54974, Nairobi

Mr. Samson N. Nyamwaya, Principal Project Officer, Industrial Development Bank Limited, P.O. Box 44036, Nairobi

Mr. E.M. Shako, Senior Project Officer, Industrial and Commercial Development Corporation, P.O. Box 45519, Nairobi

Mr. Philip Nguyai Mbari, Senior Project Officer, Industrial and Commercial Development Corporation, P.O. 45519, Nairobi

Mr. P. Kiragu Mugwe, Engineer, Morris and Company Limited, P.O. Box 18310, Nairobi

MAURITIUS

Mr. Vishwamber Gopauloo, (Robin) Assistant Factory Engineer, Sections Rolling Limited, Goomanee Lane, Morc, Goomanee, Coromandel, Telex 4260, Fax 2085843 Beau-Bassin

Mr. Cho Lin Wing Clement, Manager, Desbro International Limited, 25 Vuillemin Phase II, Telex 426C, Tel: 212648/2124788, Fax 2085843, Beau Bassin

MOZAMBIQUE

Dr. T.M. Senzani-Chicogo, Director General of Metallurgy, Ministry of Industry and Energy, P.O. Box 225, Telex 6-262 CIFEL-MO/6-261 GPMIE-MO, Tel: 42-10-21/74-48-02, Maputo

Mr. Francisco Joao Chongo, Rolling Mill and Wire Drawing Director, CIFEL, P.O. Box 441, Telex 6-262 CIFEL-MO/6-261, Tel: 400315/400201, Maputo

UGANDA

Dr. Muhairwe William, General Manager, East African Steel Co-operation (EASCO), P.O. Box 1023, Jinja

Mr. Bbaale Edward, Engineer, TUMPECO, P.O. Box 3151, Tel: 221315/6, Kampala

TANZANIA

Mr. Sovello A. Mgani, Deputy Works Manager, STEELCAST, ALAF Limited, P.O. Box 9032, Dar-es-Salaam (Tel: 62011, 64891, 36450)

ZIMBABWE

Mr. Van Rensburg, Manager, Zimbabwe Iron and Steel Company, P/Bag 2, Telex ZW 7318, Redcliff

AUSTRIA

Mr. Warner Pilz, Representative of Austrian Government, Federal Chancellery of Austria, Department for Development Co-operation, Ballhausplatz 2, A-1010, Vienna

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Mr. Tamas Grof, Industrial Development Officer, UNIDO, Vienna International Centre, A-1400, Wien, P.O. Box 300, Vienna

Dr. Rudolf Richter, Engineer, A-4030 LINZ, Fasangweg 40, Fax/Tel: 0043-732-306052, Austria

Mr. Gerhard Scherrer, Engineer, UNIDO, 4893, Zell am Moos 28G, Voest Alpine Industrial Services, A-4020 LINZI P.B 4, Austria

Dr. Rudolf Stefec, Director, National Information Centre, 23 Havelkova, CS-13000 Prague, Czechoslovakia

PTA SECRETARIAT

Mr. J.E.O. Mwencha - Director of Industry and Energy Division

Mr. J.A. Alele Opio - Senior Industrial Expert

Prof. F. D. Yamba - PTA Consultant on Engineering, Telex - 45260

Mrs. R.C. Sakala - Secretary

STATEMENT BY SENIOR KENYAN GOVERNMENT OFFICIAL AT THE OPENING CEREMONY OF THE WORKSHOP ON STEEL PLANTS AND ROLLING MILLS REHABILITATION IN PTA COUNTRIES

MR. CHAIRMAN;
THE DIRECTOR OF INDUSTRY AND ENERGY - PTA
THE UNIDO REPRESENTATIVE - DR. T. GROF;
THE AUSTRIAN GOVERNMENT REPRESENTATIVE - MR. PILZ;
DISTINGUISHED PARTICIPANTS;
LADIES AND GENTLEMEN;

ON BEHALF OF THE GOVERNMENT OF THE REPUBLIC OF KENYA, THE PEOPLE AND INDEED ON MY OWN BEHALF, I WISH TO EXTEND A VERY WARM WELCOME TO EACH ONE OF YOU TO NAIROBI, KENYA. SOME OF YOU MAY HAVE BEEN HERE BEFORE WHILE OTHERS HAVE COME TO KENYA FOR THE FIRST TIME. PLEASE FEEL AT HOME AND ENJOY YOUR STAY IN OUR COUNTRY.

MR. CHAIRMAN;

ALLOW ME TO MAKE BRIEF REMARKS ON THE ECONOMIC DIFFICULTIES MOST OF OUR COUNTRIES IN THE SUBREGION FACED WITH AND CONTINUE TO EXPERIENCE. THE GROWTH OF OUR ECONOMIES HAS BEEN HINDERED BY A COMBINATION OF FACTORS; THE WORSENING DEBT BURDEN, DETERIORATION IN TERMS OF TRADE, RAPID POPULATION GROWTH, PROLONGED DROUGHT AND INTERNAL CONFLICTS HAVE ALL COMBINED IN A REINFORCING MANNER TO ADVERSELY AFFECT OUR ECONOMIES. INDEED THE SEVERITY OF OUR ECONOMIC PROBLEMS IN THE 1980s LED TO THE DECLRATION OF THE INDUSTRIAL DEVELOPMENT DECADE FOR AFRICA.

I DO NOT INTEND TO GO INTO DETAILS OVER THESE PROBLEMS. IT WILL, HOWEVER, SUFFICE TO MAINTAIN THAT AS A RESULT OF THESE HOSTILE FACTORS, OUR ECONOMIES HAVE, IN GENERAL, BEEN CHARACTERIZED BY HIGH INFLATION, DECLINE IN EXPORTS, REDUCTION IN VOLUME OF EXPORTS, HIGH DEVALUATION OF OUR ECONOMIES, WORSENING BALANCE OF PAYMENT AND RISING UNEMPLOYMENT.

IN OUR ENDEAVOUR TO REVERSE THIS DECLINE IN OUR ECONOMIES, IT HAS BECOME QUITE CLEAR THAT ONLY COLLECTIVE EFFORT WOULD LEAD US TO THE DESIRED RESULTS. IT IS FOR THIS REASON THAT THE PTA WAS ESTABLISHED.

IN THIS CONNECTION, IT MIGHT BE USEFUL TO REMIND OURSELVES OF THE OBJECTIVES OF THE PTA. THE AIM OF THE PREFERENTIAL TRADE AREA IS TO PROMOTE CO-OPERATION AND DEVELOPMENT IN ALL FIELDS OF ECONOMIC ACTIVITIES PARTICULARLY IN THE SECTORS OF TRADE, CUSTOMS, INDUSTRY, TRANSPORT, COMMUNICATIONS, AGRICULTURE, ENERGY, NATURAL RESOURCES AND MONETARY AFFAIRS WITH A VIEW TO RAISING THE STANDARD OF LIVING OF OUR PEOPLE AND FOSTERING CLOSER RELATIONSHIP AMONG MEMBER STATES AND ULTIMATELY CONTRIBUTING TO THE DEVELOPMENT OF THE AFRICAN CONTINENT.

SPECIFICALLY, THEREFORE, THE PTA IS AN INSTRUMENT FOR: SELF-SUSTAINING AND SELF-RELIANT ECONOMIC DEVELOPMENT; AND FOR THE ESTABLISHMENT OF A COMMON MARKET AND EVENTUALLY AN ECONOMIC COMMUNITY IN CONFORMITY WITH THE LAGOS PLAN OF ACTION.

SINCE THE COMMENCEMENT OF ITS OPERATIONAL PHASE, THE PTA HAS PUT IN PLACE A NUMBER OF INSTRUMENTS AND ACTION PROGRAMMES IN ALL THE SECTORS ALLUDED TO EARLIER.

THESE INSTRUMENTS AND ACTION PROGRAMMES MAY BE KNOWN TO MANY OF YOU BUT ALLOW ME TO FOCUS BRIEFLY ON THE INDUSTRIAL SECTOR. IN THIS SECTOR PRIORITY AS BEEN ACCORDED TO THE REHABILITATION AND UPGRADING OF EXISTING INDUSTRIES, AS WELL AS THE ESTABLISHMENT OF NEW ONES WHERE NECESSARY. IN SPECIFIC TERMS, THE PROGRAMME COVERS THE REHABILITATION AND RATIONALIZATION OF EXISTING METALLURGICAL AND ENGINEERING INDUSTRIES, THE RATIONALIZATION OF THE BUILDING MATERIALS INDUSTRY, FOCUSSING IN THE FIRST INSTANCE, ON EXISTING CEMENT PLANTS, THE DEVELOPMENT OF FERTILIZER AND CHEMICAL INDUSTRIES, INCLUDING PESTICIDES AND PHARMACEUTICAL PRODUCTS, AND OPERATIONS IN THE EXPLOITATION AND UTILIZATION OF ENERGY RESOURCES OF THE SUBREGION. THE MAIN OBJECTIVE IS THE ESTABLISHMENT OF A VIABLE COMPETITIVE INDUSTRIAL SECTOR CAPABLE

OF PRODUCING CONSUMER GOODS, CAPITAL AND INTERMEDIATE GOODS AS WELL AS SPARE PARTS.

MR. CHAIRMAN;

DISTINGUISHED PARTICIPANTS;

IN MANY OF THE PTA MEMBER STATES THE PICTURE THAT PRESENTS ITSELF IS TO SAY THE LEAST, VERY DISQUIETING. IN THESE COUNTRIES, PARTS OF ABANDONED MACHINERY AND EQUIPMENT, CANNIBALIZATION OF PLANT; MACHINERY USED BEYOND THEIR LIVES AND SAFETY; NON-AVAILABILITY OF SPARE PARTS; ORDERING OF NEW EQUIPMENT INSTEAD OF REPAIR AND MAINTENANCE; AND IMPORTATION OF GOODS WHICH WOULD HAVE BEEN PRODUCED BY UNUSED FACILITIES, ARE THE ORDER OF THE DAY.

THIS GLOOMY PICTURE HAS BROUGHT INTO SHARP FOCUS THE DIRE NEED FOR OUR SUBREGION TO MAKE MORE EFFECTIVE USE OF THE INDUSTRIAL PRODUCTIVE ASSETS ALREADY ESTABLISHED AT ENORMOUS COST. EFFECTIVE UTILIZATION OF EXISTING INDUSTRIAL CAPACITIES IN PTA COUNTRIES IS THEREFORE A KEY ELEMENT OF THE PTA STRATEGY FOR THE INDUSTRIAL CONTROL OF THE SUBREGION. THE UNDP/AUSTRIAN GOVERNMENT FUNDED PROJECTS ON REHABILITATION AND RATIONALIZATION OF MINI-STEEL PLANTS/ROLLING MILLS IN PTA COUNTRIES FROM WHICH SOME OF THE PLANTS IN OUR SUBREGION BENEFITED WAS DESIGNED TO FULFILL THIS STRATEGY. BESIDES THE IRON AND STEEL INDUSTRY PLAYS A VERY CRUCIAL ROLE IN THE INDUSTRIALIZATION PROCESS.

THIS WORKSHOP, THEREFORE, COMES AT A MOST APPROPRIATE TIME AND IT IS MOST GRATIFYING THAT THE PARTICIPANTS ARE DRAWN FROM ACTUAL OPERATING STEEL PLANTS IN OUR SUBREGION. IT IS THUS MY ARDENT HOPE THAT YOU WILL AT THIS WORKSHOP EXCHANGE IDEAS, INFORMATION, AND EXPERIENCE AND LEARN FROM EACH OTHER AS WELL AS ESTABLISH THE SEEDS FOR FUTURE CO-OPERATION AMONG YOURSELVES. IT WOULD ALSO BE MOST USEFUL IF YOU CHARTERED THE WAY FORWARD FOR IRON AND STEEL INDUSTRY IN THE SUBREGION.

MR. CHAIRMAN

I WISH TO CONCLUDE BY EXPRESSING MY GRATITUDE TO THE AUSTRIAN GOVERNMENT, UNDP AND UNIDO FOR THE SUPPORT AND ASSISTANCE THEY HAVE PROVIDED AND CONTINUE TO GIVE TO THE PTA PROGRAMMES. KENYA GREATLY APPRECIATES THE DECISION BY PTA TO HOLD THIS WORKSHOP IN NAIROBI AND ON THIS NOTE, I NOW DECLARE THE WORKSHOP OPEN.

THANK YOU.

STATEMENT BY MR. J.E.O. MWENCHA THE REPRESENTATIVE OF PTA ON THE OCCASION OF OPENING OF THE WORKSHOP ON STEEL PLANT AND ROLLING MILL REHABILITATION ON 15 JULY 1991 IN NAIROBI, KENYA

MR. CHAIRMAN;
MR. GILBERT OKELLO, DIRECTOR OF INDUSTRIES;
THE REPRESENTATIVE OF AUSTRIAN GOVERNMENT MR. PILZ;
THE REPRESENTATIVE OF UNIDO MR. GROF;
THE REPRESENTATIVE OF UNDP MR.....
DISTINGUISHED RESOURCE PERSONS;
DISTINGUISHED PARTICIPANTS;
LADIES AND GENTLEMEN;

ON BEHALF OF THE SECRETARY GENERAL OF THE PTA, I WOULD LIKE TO JOIN OUR GUEST OF HONOUR IN WELCOMING YOU TO THIS FIRST WORKSHOP ON STEEL PLANT AND ROLLING MILL REHABILITATION IN THE PTA COUNTRIES WHICH KENYA HAS KINDLY AGREED TO HOST.

FIRST, ALLOW ME, OUR GUEST OF HONOUR, THROUGH YOU TO PAY SPECIAL TRIBUTE TO HIS EXCELLENCY PRESIDENT DANIEL TOROITICH ARAP MOI, THE GOVERNMENT AND THE PEOPLE OF KENYA FOR THEIR UNFLINCHING SUPPORT TO THE CAUSE AND OBJECTIVES OF THE PTA. YOUR GOVERNMENT'S ACCEPTANCE TO HOST THIS WORKSHOP IS A CLEAR TESTIMONY OF THE SUPPORT KENYA HAS FOR THE PTA PROGRAMMES AND ACTIVITIES AND THIS IS VERY GREATLY CHERISHED BY THE PTA.

I SHOULD ALSO LIKE TO CONVEY OUR PROFOUND GRATITUDE TO THE INTERNATIONAL COMMUNITY FOR THE SUPPORT AND ASSISTANCE THEY CONTINUE TO PROVIDE TO THE PTA. IN PARTICULAR, THE AUSTRIAN GOVERNMENT, UNIDO AND UNDP WHO HAVE MADE IT POSSIBLE FOR THE WORKSHOP TO TAKE PLACE THROUGH THE PROVISION OF FINANCIAL AND TECHNICAL ASSISTANCE TO THE PTA. THE PRESENCE AMIDST US OF THE REPRESENTATIVE OF THE AUSTRIAN GOVERNMENT, MR. PILZ AND

THE REPRESENTATIVE OF UNIDO DR. TAMAS GROF IS A SOURCE OF INSPIRATION TO US AND IS A CLEAR EVIDENCE OF THEIR KEEN INTEREST IN PTA PROGRAMMES.

PLEASE CONVEY OUR SINCERE GRATITUDE TO YOUR PRINCIPALS WHEN YOU RETURN TO YOUR HOME BASE.

I ALSO WISH TO THANK MOST SINCERELY THE MANAGEMENT OF ROLLMILL KENYA LIMITED, FOR HAVING AGREED TO THE USE OF THEIR PLANT AS A MODEL FOR THIS WORKSHOP.

MR. CHAIRMAN;
DISTINGUISHED PARTICIPANTS;

ONE OF THE PRIMARY OBJECTIVE OF THE PTA INDUSTRIAL SECTOR, IS TO ESTABLISH VIABLE METALLURGICAL AND ENGINEERING INDUSTRIES BECAUSE OF THEIR KEY ROLE IN THE INDUSTRIALIZATION PROCESS. THE MANUFACTURE OF A VARIETY OF CONSUMER GOODS REQUIRES THE ACCELERATED GROWTH OF THE INTERMEDIATE INDUSTRIES TO PROVIDE SUCH INPUTS AS IRON AND STEEL, COPPER, ALUMINIUM AND OTHER METALLURGICAL PRODUCTS, WHICH, IN TURN, DEPENED ON THE EXPLCITATION OF THE VAST MINERAL RESOURCES AVAILABLE IN OUR SUBREGION, PARTICULARLY IRON ORE, COAL, COPPER AND NATURAL GAS. HOWEVER, OF IMMEDIATE IMPORTANCE IS THE DEVELOPMENT OF A VIABLE IRON AND STEEL INDUSTRY.

THERE ARE 23 MINI-STEEL PLANTS IN THE SUBREGION WITH ONLY ONE INTEGRATED STEEL WORKS IN ZIMBABWE - THE ZIMBABWE IRON AND STEEL COMPANY LIMITED LOCATED AT REDCLIFF IN ZIMBABWE. THE TOTAL CAPACITY FOR LIQUID STEEL IS APPROXIMATELY 1.2 MILLION TONNES OF WHICH 850,000 TONNES CAN BE PRODUCED BY ZISCO. HOWEVER, THE AGGREGATED ROLLING CAPACITY IS 1.72 MILLION TONNES WHICH THUS EXCEEDS LIQUID STEEL CAPACITY BY 57%. UNFORTUNATELY THE MAJORITY OF THE ROLLING MILLS OPERATE FAR BELOW THEIR NAMEPLATE CAPACITIES AVERAGING

ABOUT 40% CAPACITY UTILIZATION. THE REASONS FOR THIS POOR PERFORMANCE INCLUDE:

I. LACK OF SPARE PARTS;
II. LACK OF SKILLED MANPOWER FOR BOTH PRODUCTION AND MAINTENANCE;
III. LACK OF FOREIGN EXCHANGE TO PROCURE INPUTS AND PARTS;
IV. SHORTAGE OF SCRAPS PARTICULARLY FOR THOSE PLANTS WHICH MAKE THEIR OWN INGOTS OR BILLETS.

MR. CHAIRMAN;

IN ORDER TO TACKLE THESE PROBLEMS, THE COUNCIL OF MINISTERS ON THE RECOMMENDATION OF THE COMMITTEE ON INDUSTRIAL CO-OPERATION APPROVED A THREE PRONGED STRATEGY FOR THE DEVELOPMENT OF THE SUBREGION'S IRON AND STEEL INDUSTRY. NAMELY;

1. THE REHABILITATION AND RATIONALIZATION OF EXISTING STEEL PLANTS INCLUDING THE SOURCING TO THE MAXIMUM EXTENT, OF FEEDSTOCKS FROM ZISCO.

2. THE PRODUCTION OF SPONGE IRON TO SUPPLEMENT SCRAPS AS FEEDSTOCK TO MELTSHOPS FOR THE PRODUCTION OF BILLETS FOR THE ROLLING MILLS.

3. DEVELOPMENT OF OTHER INTEGRATED IRON AND STEEL PLANTS AS AND WHEN IT BECOMES NECESSARY.

IN THE IMPLEMENTATION OF THESE STRATEGIES, A THREE STAGE PROGRAMME WAS ADOPTED. IN THE FIRST PLACE, THE RECOMMENDATIONS IN THE TECHNICAL STUDIES ON THE EXISTING PLANTS PREPARED BY UNIDO/ZISCO AND COMMONWEALTH SECRETARIAT/FERRCO ENGINEERING U.K. LIMITED WERE IMPLEMENTED. THIS INVOLVED THE PROVISION OF THE REQUIRED EXPERTISE, MEASURING AND METALLURGICAL

CONTROL EQUIPMENT AND FINALLY ON-THE-JOB TRAINING AT ZISCO AND OVERSEAS TO EFFECT THE MUCH NEEDED SHOT-TERM REHABILITATION.

IN THE MEDIUM TERM, THE REHABILITATED STEEL PLANTS WOULD REQUIRE A GREATER NUMBER OF SKILLED PERSONNEL. THESE WOULD ONLY BE PROVIDED BY A SYSTEMATIC AND CAREFUL ORGANIZED VOCATIONAL SKILL/MANAGEMENT TRAINING PROGRAMMES. THIS HAS BEEN CARRIED OUT AT ZISCOSTEEL TRAINING CENTRE AND TODATE OVER 100 ENGINEERS AND TECHNICIANS HAVE BENEFITED FROM THE PRGORAMME.

IN THE LONG-RUN THE DEVELOPMENT OF IRON AND STEEL PRODUCTION FACILITIES HAS TO BE ACCOMPANIED BY A PARALLEL INDIGENOUS DEVELOPMENT OF THE METALLURGICAL CAPABILITY, OTHERWISE OUR SUBREGION WILL CONTINUE O DEPEND ON OUTSIDE EXPERTISE AND IMPORTED TECHNICAL KNOW-HOW. THEREFORE, A CHARTER FOR THE ESTABLISHMENT OF A SUBREGIONAL METALLURGICAL TECHNOLOGY CENTRE IN REDCLIFF, ZIMBABWE HAS BEEN SIGNED BY HEADS OF STATE OF THE PTA. THE PTA METALLURGICAL TECHNOLOGY CENTRE (MTC) WILL BE AN INSTITUTIONAL CENTRE OF METALLURGICAL EXCELLENCE DESIGNED TO ADDRESS THE TECHNOLOGICAL NEEDS OF THE METALLURGICAL AND ENGINEERING SUBSECTOR AND OTHER ALLIED INDUSTRIES.

FIRSTLY, IT WILL PROVIDE TECHNICAL SERVICES THROUGH ITS DATA BANK, LIBRARY AND DOCUMENTAITON FACILITIES AND, IN ADDITION, IT WOULD PERFORM VARIOUS OTHER TECHNICAL SERVICES FOR THE SUBREGION, FOR EXAMPLE, ON THE ADAPTATION AND TRANSFER OF TECHNOLOGY AND THE PROVISION OF STANDARDS AND TEST CERTIFICATES.

SECONDLY, THE MTC WOULD CONDUCT RESEARCH AND DEVELOPMENT, TRAINING AND UNDERTAKE CONSULTING AND INVESTIGATORY WORK ON VARIOUS ASPECTS OF THE IRON AND STEEL AND NON-FERROUS METAL INDUSTRIES. THESE

ACTIVITIES INCLUDE THE EVALUATION AND ASSESSMENT OF LOCAL IRON AND NON-FERROUS OREBODIES, STUDIES ON LOCAL COALS, FLUXES AND ALSO MATERIALS FOR THE MANUFACTURE OF REFRACTORY. THE AIM OF ALL THIS BEING THE UTILIZATION OF MATERIALS AVAILABLE IN THE PTA SUBREGION FOR THE LOCAL IRON AND STEEL AND OTHER METALLURGICAL INDUSTRIES. THE CENTRE WILL BE ESTABLISHED IN TWO PHASES WITH THE FIRST PHASE TO BE LAUNCHED AT THE INSTITUTE OF MINING RESEARCH, UNIVERSITY OF ZIMBABWE, TOWARDS THE END OF THIS YEAR. THE MAIN CENTRE WILL BE LINKED TO A NATIONAL INSTITUTION DESIGNATED BY EACH MEMBER STATE AS A FOCAL POINT.

DISTINGUISHED PARTICIPANTS;

THIS WORKSHOP IS A DIRECT RESULT OF THE REHABILITATION AND RATIONALIZATION PROGRAMME ALLUDED TO EARLIER. THIS PROGRAMME WHICH WAS FUNDED BY THE AUSTRIAN GOVERNMENT AND THE UNDP BUT EXECUTED BY UNIDO CAME TO AN END IN 1990. HOWEVER, THE REPORT OF THE CONSULTANTS WHICH YOU WILL HAVE THE OPPORTUNITY TO DISCUSS HAD AS ONE OF ITS RECOMMENDATIONS THE HOLDING OF A WORKSHOP ON STEEL PLANTS REHABILITATION AND WE ARE INDEED MOST GRATEFUL FOR THE VERY QUICK DECISION THAT AUSTRIAN GOVERNMENT MADE TO FUND THE WORKSHOP.

IN OUR VIEW, THIS WORKSHOP SHOULD ENABLE YOU AS OPERATORS IN THE IRON AND STEEL INDUSTRY IN OUR SUBREGION TO EXCHANGE VIEWS AND INFORMATION, EXPERIENCES, KNOW-HOW AND DEVELOP FUTURE MODALITIES FOR CO-OPERATION AND EXCHANGE AMONG YOURSELVES. THE AIM OF THE PTA IS TO INTEGRATE THE ECONOMIES OF THE PTA COUNTRIES AND THIS MEANS THE INTEGRATION OF THE IRON AND STEEL INDUSTRY IN THE PTA BUT MORE GENERALLY THE INTEGRATION OF THE INDUSTRIAL SECTOR AS A WHOLE. I AM CONFIDENT THAT YOU WILL BE ABLE TO RISE TO THIS CHALLENGE AND CHART THE WAY FORWARD FOR THIS VITAL SUBSECTOR.

I THANK YOU

UNIDO/PTA

NAIROBI WORKSHOP ON STEEL PLANT REHABILITATION

1991

REPORT ON THE STATE OF THE ART OF SELECTED STEEL PLANTS OF THE REGION, AND RECOMMENDATIONS ON REHABILITATION

Presentation by

Rudolf Stefec (CSFR)

UNIDO Consultant

I. THE SUBREGIONAL ASPECTS

A. Raw materials for steelmaking and fabrication

Depending on the production practices and process units at a specific steel plant, the raw materilas consumed during iron and steel production include:

- iron ore, metallurgical coal, scrap, sponge iron, alloying elements, water;
- limestone, lime, refractories, graphite electrodes; and
- electricity and natural gas

Iron ore: Large resources of iron ore are known to occur in several countries of the PTA region. Only a fraction of these reserves would be technically extractable and economically beneficiable for purposes of iron and steel production. By far the largest reserves are in Zimbabwe (with about 59 per cent of the total) and in Angola (which accounts for 19 per cent). In Kenya, iron ores are scattered in various parts of the country.

Coal: Only Botswana, Mozambique, Zambia, Zimbabwe and in a small extent Tanzania now operate coal mines. In all cases except Zimbabwe, coal is produced for power generation and export. Whereas cokable coal occurs also in Mozambique and Swaziland, only that of Zimbabwe is employed for iron and steelmaking. The subregion's coal resources could be potentially useful as a reductant in coal based iron ore direct reduction processes for the production of sponge iron.

Ferrous scrap: Virtually all steel producing units in the P.T.A. countries use ferrous scrap as their main input. Local availability of scrap is constrained. Scrap collection, processing, and delivery to steel plants are inefficient. For these reasons, the differences between the prices of local and imported scrap have been narrowing, making the latter increasingly attractive.

There are no shipbreaking activities.

Intra-regional trade in scrap is totally absent in the PTA subregion.

While scrap is a scarce commodity in general (e.g., in Kenya, Tanzania, Zimbabwe), there is a number of countries (including, e.g., Mozambique and Mauritius) where there are no melting capacities whatsoever so scrap ought to be accumulating.

In the absence of objective studies of the scrap sources, an extrapolation of indicative data[1] to the year 1990 gave estimates of the annual scrap generation rates, exclusive of "home" scrap generated and consumed by operating steel plants:

Kenya	20,500 tpy
Tanzania	10,500 tpy
Mozambique	3,500 tpy
Mauritius	4,500 tpy

Availability of scrap is assumed to increase by 5 % per annum.

Summing up, all the PTA countries on the African continent face

---

[1]Gathered by the Regional and Country Studies Branch, UNIDO.

problems not only with the collection of steel scrap but also as regards the generation of scrap. This is particularly true of Kenya and Tanzania. In Mozambique there is potential for collecting considerable quantities of scrap because of the absence of any appreciable melting capacity. On a magnified scale, this is true of the island of Mauritius where at present, some scrap is exported (but not to the PTA countries).

Direct reduction iron: Possible locations in Mozambique and Tanzania are both based on a revival of projects formerly considered.

The slag forming and refractory minerals: The fluxing minerals in steelmaking are limestone, dolomite, fluorspar and silica. Limestone, dolomite and silica reserves of suitable quality for metallurgy occur widely across the subregion.

Several countries in the subregion are endowed with commercial reserves of some of the refractory minerals, but only simple fireclays are manufactured in Zimbabwe and Kenya for local consumption. The balance is imported.

Alloying minerals and ferroalloys: Chrome ore deposits are in Zimbabwe, which alone accounts for more than 85 % of the world's reserves of high chrome ores. Zambia has cobalt reserves, and significant reserves of nickel ore occur in Burundi, Zimbabwe, Botswana, and Madagascar. Basic ferroalloys needed for steel production such as ferromanganese and ferrosilicon are not produced in the subregion and must be imported.

Electricity resources: Tanzania, Mozambique, and Zimbabwe have considerable electricity resources. In Kenya, KUSCO has to draw on power from a hydroelectric power station some 700 miles away. Mauritius commissioned the Champagne Hydro-Power Station in 1987.

Electric power requirements of the steel industry are essentially covered at present except in Mozambique but, generally, the problem of long-distance transmission and consequently, high cost of power must be faced by most of the producers in continental Africa.

Natural gas: Only Angola, Mozambique, and Tanzania have been able to demonstrate commercially exploitable natural gas resources. There is virtually no commercial extraction sofar. Advance of major DRI and fertilizer production projects may provide the impetus.

B. Role of steelmaking and fabrication in manufacturing

In all the countries of the subregion, iron and steel is a critical commodity for the industrialization of a nation. In Kenya, many industries have been set up and there has been backward integration. The billets and hot rolled coils remain the main imported raw materials.

The country needs to make both billet and hot rolled coils for the existing and future downstream industries. Currently the country has 13 iron and steel mills having installed capacities of about 500,000 tpy, but the actual production is much lower due to lack of raw materials. There are only two mills which use hot rolled coils to produce cold rolled coils.

Kenya requires a steel mill to produce billets and hot rolled coils for the existing mills.

In Tanzania, the National Development Corporation (NDC) is responsible for the over-all running and development of metal working and metal forming industries, engineering industries, and electrical industries. A brief survey reveals the following status. At SRM Tanga, nothing new came up since launching commercial production in 1971. The expansion programs, which started in early eighties, are not yet completed because of the above mentioned economic problems. At ALAF all the planned expansion programs could not take off because, once again, of the economic problems. There was hardly any growth in the other companies of the sector either.

NDC now is coming up with sectoral plans for future development to the year 2000 and beyond.

The role of steelmaking and steel fabrication in Mauritius must be seen in the light of the booming construction industry there. In view of the improving economic climate, there is considerable potential for the steel companies. The rolling mill production totals some 28,000 tpy (mostly of rebars) and 5,000-8,000 tpy more are imported; most of the imports is 6 mm wire. However, the local producers have to compete with the imports. There is no melting furnace in the country.

ZISCO in Zimbabwe produce a very wide range of products in order to cover the country's requirements. The view is held there that the total capacity of steel production, which is near 1 mln tpy from ZISCOSTEEL alone, ought to be enough for the whole of the PTA subregion; hence, efforts to set up large plants elsewhere in the subregion seem to be unwarranted by the present demand.

The situation of Mozambique seems to be the least envious at the moment; much of the engineering industry would come to a halt should the present strains preventing Mozambiquean steel producers from actually producing persist much longer. The role of steelmaking in manufacturing should again become pivotal as soon as the external strains on the economy are eased. The projects of CIFEL rehabilitation would have to be given much higher priority then, but only on the condition that the rolling mill will be freed from the frequent power outages and other external problems. Of course, Mozambique also stands to benefit from all the flow of steel semis and products on the Beira line as soon as this is fully available again; this is a very important consideration to all the landlocked PTA countries.

C. Steel mills and related facilities

A list of companies comprising the Kenyan iron and steel industry is shown overleaf, compiled from data furnished by the Kenya Ministry of Industry:

Existing installed capacities and actual production capacities for 1988 in metric tons

Name of company	Installed Capacity	Production 1988	Operation
Rolmil Kenya Ltd	30,800	16,271	melting and hot rolling
Special Steel Mills Ltd.	75,000	41,360	hot rolling
Steel Makers Ltd.	20,000	15,000	hot rolling
Emco Steel Works Ltd.	25,000	14,527	melting and hot rolling
Morris & Company Ltd.	25,000	16,000	hot rolling
Mabati Rolling Mills Ltd.	120,000	72,000	cold rolling
Iron International Ltd.	11,930	2,270	hot rolling
Iron Africa Ltd.	15,000	7,426	hot rolling
Standard Rolling Mills Ltd.	12,000	-	cold rolling
Steel Rolling Mills Ltd.	20,000	closed	hot rolling
Steel Billet Casting Ltd.	30,000	under receivership	melting and hot rolling
City Engineering Works Ltd.	5,000	-	melting and hot rolling
Kenya United Steel Company Ltd.	40,000	22,000	melting and hot rolling
TOTAL	429,730		

In Tanzania's metal working and metal forming industries, there is a smaller and yet substantial national capacity available as detailed below:

Name of company	Installed capacity (tpy)	Operation
Aluminium Africa Ltd.		
- Galco Division	36,000	
- Steelco Division	72,000	cold rolling
- Pipeco Division	18,000	
- Steelcast Division	18,600	melting
Steel Rolling Mills Tanga	20,000	hot rolling
Zana za Kilimo, Mbeya	4,000	
Ubungo Farm Implements	5,000	
National Bicycle Co.	3,000	
SIDO	5,000	
Others	2,000	
TOTAL	183,000	

There is a large gap to balance the demand-supply equation.

D. Intra-regional trading in steel and steel products

The steel industry's product mix consists of blooms and billets (for further rolling) as well as "long" products for the construction and engineering industries, in the form of bars (round, square, and flat, plain and twisted), rods (for wire production) and light and medium sections (angles, channels, beams, and light rails). There is no facility for production of sheet, strip and plate, and the subregion's demand for this category of steel mill products is supplied through imports.

With the exception of Zimbabwe and to some extent, Kenya, none of the countries of the subregion participate regularly in the steel export trade, whether within or outside the PTA.

The scope for subregional trade in steel will depend much on whether plate production will take place and the extent to which billets are supplied from Zimbabwe to the rest of the subregion. Of course, the plans to expand into flat products have been

entertained at ZISCO for a long time but shortage of investment intervened sofar. If production for subregional consumption remains limited to present products, trade patterns will largely be as at present. If plate production covering only half of subregional demand is started by 1995, intertrade flows in basic steel products would at least increase by a factor of 5. If projected regional demand for billets in 1995 was covered as far as possible by Zimbabwean exports it would mean a 6-7 fold increase in the volume of billet trade.

One problem is that ZISCO in Zimbabwe stand very much alone in the subregion, and a situation may develop where the company would be "missing yardsticks" as to quality of production and trading orientation.

Another problem facing ZISCO and, for that matter, any other, potential large producer of basic steel products like ingots, blooms, and billets, is the surplus cost incurred due to long, inefficient transport. Indeed, ZISCO would be well advised to turn more to domestic sales so as to avoid losing on the railways.

II. STEEL PLANTS OF THE SUBREGION, THEIR PROBLEMS AND REMEDIES

A Kenya United Steel Company Limited

Scrapyard and charge preparation. The problems are as follows:

- different scrap sizes are not stored separately
- heavy scrap cannot be handled by available scrap preparation methods
- very light scrap cannot be compressed by existing press because of springloading effect
- too many buckets (4 - 5) must be charged in one heat because the scrap density is low and the share of large pieces is considerable
- pig iron and petroleum coke needed to raise the carbon content are not readily available.

It is recommended that the above problems and insufficiencies be rectified as follows:

1) By rearrangement of scrap handling: this should include

- separate storage of different sizes and qualities
- optimal scrap blending.

2) By cutting or compressing all long pieces of scrap to small pieces (max. 0.5 m in length). This can be done through

- expanding the oxygen scrap-cutting gangs
- acquiring a drop hammer for getting rid of heavy scrap, either cast iron or cast steel
- making efforts to prepare scrap so as to avoid spring-loading which makes charging difficult

3) By raising the carbon content of the charge (to min. 0.30% C) through addition of pig iron or coke or coke fines to the first bucket.

The objective of above improvements is to attain the following target values:

- improved scrap density (0.75 ton/cu m)
- reduced charging and melting times (by 10 - 15 min)
- cutdown in power consumption (by 5 - 10 kWh/ton)
- lower consumption of refractories (by 1-2 kg/ton)
- achievement of standard melt-down analysis of carbon (0.30 % C).

Additions, alloys, and refractories.

- As limestone will need additional energy for calcination and furthermore will lose approx. 50% of its weight, it cannot be regarded as an advantageous slag former for the EAF.
- Charcoal is not a very efficient carburizing agent.

Suggested rectification: Consider gaining access to a suitable source of burnt lime, to replace limestone. Check on the potential of producing soft burnt lime at the lime factory near Mombasa. Import coke breeze from ZISCO for effective carburization.

Steelmaking process. There are following major problems:

- the production of steel is the bottleneck of the production cycle, mainly because the two EAFs cannot be run simultaneously at daytime due to high cost of power
- the carbon content of the EAF charge is often low
- the tapping temperature is higher by no less than 30°C as against the temperature setpoint for the grade of steel in question taking into account the method of pouring and the size of the ingots, because of the high temperature differential in the ladle, and consequent difficulties at pouring of the pencil ingots
- poor heat output due to light scrap
- current recarburizing process (immersion of electrodes) is very expensive and ineffective in case of over-oxidized steel bath
- yield of alloying elements is poor, consumption of ferro-manganese in 1989 was higher by more than 0.5 kg/ton (6.3 kg/ton) as against foregoing years and higher by ca 1 kg/ton than would correspond to good standard practice
- the technology used, giving no opportunity for systematic dephosphorization and desulfurization, with deficiencies in the area of temperature control, would prevent the production of higher grade steels and would also have to be changed in case of continuous casting
- chemical composition is out of bounds in 7% of cases which is higher than would correspond to standard practice for this plain carbon steel (max. 3%)
- the consumption rate of electrodes (7.2 kg/tons) as well as the electric power consumption (658 kWh/tons) are higher than standard and experienced a growth in recent years. The reasons are steel overheating, a protracted charging period, and carburization of steel bath by immersion of electrodes
- electrode control at no. 2 furnace needs readjustment
- analysis for carbon takes too long (10 minutes) because emission spectrometer is out of operation
- logbook entries lack downtime indications.

Above deficiencies can be rectified by

1) a national program of hydroelectric power development

2) ensuring a sufficient carbon content after melting (0.25-30%), through addition of suitable carbonaceous agents

3) decreasing the tapping temperature to ca 1640°C and limiting the temperature differential in ladle by ladle preheating; checking temperature by optical pyrometer during pouring

4) improved temperature and chemical composition control during the heat; this can be achieved through the use of a combination probe for simultaneous measurement of temperature and the carbon content

5) deoxidation of over-oxidized steel bath using aluminum pig or ingot fixed onto a steel pole

6) making efforts to be prepared for introduction of a controlled deoxidation process, in order to allow for the production of high-tensile strength deformed rebars; such a process will be indispensable anyway as soon as the caster is erected

7) mediation of contact with a servicing center in Europe to re-activate type ARL 3300-77 emission spectrometer which developed a vacuum problem.

The objective of above improvements is to attain the following target values:

- cutdown in tap-to-tap times to 130 min converting to a daily production increase from 38 tons to 44 tons (at 4 tons average weight of heat and assuming the present technology)

- cutdown in the specific consumption of electric power from 650 kWh/ton to 610 kWh/ton

- reduction of incidence of out-of-bounds chemical composition to below 3%

- cutdown of electrode consumption from 7.2 to 6 kg/ton

- 5% cutdown in refractories consumption.

Casting pit.

- Ladles are not preheating between heats. Consequently, the temperature of the ladle lining is low (under 200°C). This is due to the high costs of operating the gasoline burner. Cold lining is responsible for the considerable drop in temperature before pouring is started, and for problems encountered at startup of pouring because of freezing at the narrow mold inlet. The crew tend to extremely overheat the steel to avoid this. Again, ladle preheating would help.

Suggested rectification involves the following action: Preheat ladles to min. 600°C. Reconstruct burner to accept cheaper fuel oil.

The objective of above improvements is to attain the following target values:

- lower tapping temperatures (by min. 30°C)
- lower firebrick consumption (by 10% thanks to less lining wear)
- avoid skulling in ladles.

Molds for pencil ingots are not readily available. This is an additional argument in favor of CC.

Priorities. Summing up, the priorities of above problems and their effects on capacity utilization at the KUSCO steelmaking shop are as follows:

1) High cost of electric power (peak demand) preventing an economical operation of the two EAFs in parallel. This factor is entirely out of company control.

2) Shortage of scrap, scrap processing, and controlled carburization of EAF charge.

3) Elimination of heat control problems

4) Ladle preheating between heats.

Rolling mill. The following major problems were identified:

1) None of the six Kenyan rolling mills (incl. KUSCO) works to full capacity, because of constraints but also because of slack demand for the given product mix. It is recommended that the product mix of KUSCO be gradually expanded by deformed rebars, a high-tensile steel grade, and wire rods down to 5.5 mm dia. This recommendation of course entails a number of measures at both the steelmaking shop and the rolling mill as discussed below. The benefits include reduced imports of billets, increased rolling mill throughput, and a less vulnerable position on the market.

2) KUSCO production of pencil ingots is not high enough to fully cover the need of starting stock for the rolling mill. Billets 80 by 80 mm must be imported. This bottleneck would be overcome by installation of the CC facility but this would have to be expanded from one-strand to two-strand. Reconsideration of shipbreaking as an alternative source of scrap would be worthwhile.

3) All wire for the fabrication of fences, barbed wire, and nails is purchased/imported. Rods of 8 mm diameter, available from own

rolling mill is presently used for wire mesh (50 tons per month) but cannot be used for drawn wire production unless the steel composition can be better controlled and unless the finishing part of the rolling mill is modified and expanded so as to include additional finishing stands and controlled cooling or heat treatment. Hence, another 750 tons per month of low-carbon drawing stock is imported from ZISCO. Total tonnage of wire rod purchased is 24,000 - 27,000 tpy. A study into the possibility of establishing a wire rod mill would be worthwhile.

4) Cold-twisted, higher-tensile square rebars are the only type which meets present Kenyan standards; more sophisticated products like ribbed, high-tensile rebars would increase mill throughput at given capacity utilization and would save material (to the customer). High-tensile strength deformed rebars cannot be made unless the EAF process control is improved. Promotion of this kind of products should go hand in hand with metallurgical improvements in the steelmaking shop. The problems associated with the necessity to master the production of higher-tensile grades at KUSCO were discussed in detail with the management.

5) The existing reheating furnace is in good shape and capable of control. Instrumentation for offgas analysis would contribute to a higher standard of furnace operation and control. The furnace underwent considerable changes: the number of burners was reduced from four to two and the number of zones from two to one, with ensuing fuel savings. The chief recommendation was to use the reheating furnace offgas analyzer (on the list of UNIDO supplied equipment) to improve heating control and save fuel.

6) The furnace design, with a dropout type discharging system, causes downtimes amounting to 2 minutes per 10 pieces when charging ingots or billets. Every second pencil ingot must always be turned 180° after exiting from the furnace. The recommendation is to tackle this constraint together with general mill upgrading which would involve the installation of a new reheating furnace. The new furnace should be equipped with a recuperator.

7) The existing roughing mill stand has rolls of rather small diameters, making it difficult to run heavier starting stock. Moreover, the roughing mill is not equipped with a safety breaker. Rolls are fractured in case of a billet sticking. This is a serious constraint which makes it difficult to fully use the potential of the CC facility. It is recommended that, until and unless a decision is made on the general overhaul of the rolling mill train which would include e.g. a continuous roughing stand, the option of erecting a 16" roughing stand should be considered. Even a second-hand, reconditioned roughing mill would be acceptable.

8) Renovation of roughing mill rolls by overlaying and machining

is not practiced. This should be introduced as soon as possible, making use e.g. of the experience of SRM, Tanga. This would limit the imports of rolls (now imported from Sweden).

9) The service life of the fiber slide bearings on the roughing stand is too short. Imports from Germany should be replaced by imports from an alternative supplier (India) identified to KUSCO management.

10) Mild steel tubular guides wear rapidly at the outlet of the intermediate train. Recommended guides are heavy-wall, high-carbon or alloy steel seamless tube guides.

11) There is no optical pyrometer to measure temperature in furnace and along the train. An infrared optical pyrometer was put on the list of suggested UNIDO equipment. This is particularly useful not only to check on the reheating furnace temperature but also to check on the end temperature of rolling (needed when switching to the production of wire for subsequent drawing.

12) One crane for the rolling mill is not sufficient in case of three-shift operation. Mill changes and most repairwork are presently done mainly during the third shift. All development programs also must reckon with more than one crane, for adequate handling.

Quality control. This is not a serious problem at present, except for the spectrometer failure mentioned above. Also, KUSCO have a tensile tester as well as laboratory instrumentation for routine control of rolled stock produced. However, quality is a constraint in the sense that KUSCO cannot produce high tensile grades at present, and also cannot produce wire rod which can be drawn; these issues are attended to elsewhere in this report.

Maintenance. The problems are follows:

1) Heavy loads have to be handled by makeshift methods in absence of an adequate puller/pusher device. This is the case when dismantling the rolling mill equipment for repairs. An universal hydraulic puller/pusher set was recommended and furnished by UNIDO.

2) Maintenance of cranes suffers from lack of spares

Maintenance of cranes is an unresolved problem, with frequent gearing and gearbox failures and a general lack of spares.

Training. Management are very capable but training is required in the following specific areas: (i) utilization of computer assisted steelworks modeling (with the finance manager participating); (ii) participation in an exchange program where a KUSCO shop manager should visit ALAF (mainly for the purpose of gaining first-hand CC experience) and a maintenance manager

should visit SRM (to share KUSCO practice and to acquire technologies practiced at SRM in the area of roughing roll renovation and wire rod mill operation)[2], while the finance and/or development managers would benefit most by visiting DESBRO and/or Sections Rolling (two other fairly successful private companies covering a similar product range); (iii) on-the-job training for a shop manager in a well run mill of comparable size.

Recapitulation of capacity utilization. Present capacity utilization figures at the EAF and rolling mill are 68.7-71.7 and 70.6 %, respectively. Conservative target figures that can be achieved without major investment, through implementation of the recommendations and measures outlined above, are 74 and 73 %, respectively. It has to be borne in mind that the time utilization figures are based on the present operating mode where the two EAFs rarely work simultaneously.

---

[2]Sharing of experience is particularly useful here because of small geographical distance, identical rolling mill supplier, and similar mill designs.

B Steelcast Division of Aluminium Africa Limited (ALAF)

Scrapyard and charge preparation. Recapitulating, the problems are as follows:

- different scrap sizes are not stored separately
- very light scrap prevails but cannot be sufficiently compressed or cut because both the existing press and the hydraulic cutter are out of operation due to lack of spares
- too many buckets (4 - 5) must be charged in one heat because the scrap density is low and the share of large pieces is considerable
- pig iron and petroleum coke needed to raise the carbon content are not readily available.

It is recommended that the above problems and insufficiencies be rectified as follows:

1) By rearrangement of scrap handling: this should include
   - separate storage of different sizes and qualities
   - optimal scrap blending.

2) By cutting or compressing all long pieces of scrap to small pieces (max. 0.5 m in length). This can be done through
   - expanding the oxygen scrap-cutting gangs
   - making the press and the hydraulic shears operational again.

3) By raising the carbon content of the charge to min. 0.30% C through addition of pig iron or coke or coke fines to the first bucket.

The objective of above improvements is to attain the following target values:

- improved scrap density (0.75 ton/cu m)
- reduced charging and melting times (by 15 - 20 min)
- cutdown in power consumption (by 10-15 kWh/ton)
- lower consumption of refractories (by 1-2 kg/ton)
- achievement of standard melt-down analysis of carbon (0.30-0.40% C).

Additions, alloys, and refractories. Identified problems include

- As limestone will need additional energy for calcination and furthermore will lose approx. 50% of its weight, it cannot be regarded as an advantageous slag former for the EAF. Quality lime is not available though.

- Imported materials (electrodes, ferroalloys, refractories) cause bottlenecks because of irregular deliveries and lack of forex.

Suggested rectification consists in the following steps:

Consider gaining access to a suitable source of burnt lime, to replace limestone. Check on the potential of producing soft burnt lime at the lime factory near Tanga and hauling it to Dar es Salaam, possibly in rubber bags, by trucks returning from Tanga having transported billets to SRM. Cross-check with data from a parallel UNIDO study devoted to lime kilns in Tanzania.[3]

EAF operation. Here the major problems are as follows:

- capacity utilization of the EAF is low because of
  - shortage of scrap
  - irregular deliveries of electrodes, ferroalloys, refractories, and spares
  - power outages
  - its age and run-down condition;

- recommended practice often is not followed because of poor or nonexistent instrumentation (especially, the temperature measuring instruments are defective);

- prior to temperature measurement using the immersion tips, the steel bath is not stirred; this as a rule produces high reading if the probe is plunged under one of the electrodes;

- the work of the furnace crew during repairs is poorly organized;

- furnace door is kept open there being no mechanism to shut it;

- the carbon content of the EAF charge is often low and carburization is done by immersion of electrodes;

- the tapping temperature is higher by no less than 30°C as against the temperature setpoint for the grade of steel in question taking into account the method of pouring and the size of the strand. This overheating is due to inadequacies in furnace heat control, inaccuracy of temperature measurement, the high temperature differential in the ladle, poor bath homogenization, and consequent difficulties at the caster;

- poor heat output due to light scrap;

- chemical composition out of bounds in 5% of cases which is higher than would correspond to standard practice for this

---

[3]Author: Z. Daniszewski.

plain carbon steel (max. 3%). Such heats are not rejected though: they can still be sold, at a discount;

- the consumption rate of refractories per ton of billets produced is about 60 kg/ton; this is roughly by 10 kg/ton above the standard practice based on use of comparable refractories. At the EAF the consumption is higher by about 3 kg/tons, with the remainder lost in ladle and tundish lining;

- the consumption rate of electrodes (9 kg/tons) as well as the electric power consumption (850 kWh/tons) are higher than standard. The reasons are steel overheating, a protracted charging period, and carburization of steel bath by immersion of electrodes.

Above deficiencies can be rectified by

1) ensuring a sufficient carbon content after melting (0.25-30%), through addition of suitable carbonaceous agents;

2) decreasing the tapping temperature to ca 1650 C and limiting the temperature differential in ladle by ladle preheating;

3) improved temperature and chemical composition control during the heat. This can be achieved through upgrading the laboratory equipment (by adding an automatic carbon and sulfur analyzer (a rather costly but useful piece of equipment) and through replacement of faulty temperature indicating system by an immersion pyrometer;

4) cutting down the lining repairs between heats through improved organization of labor;

5) homogenization of steel in the furnace by agitation prior to taking temperature measurements using immersion thermocouples.

The objective of above improvements is to attain the following target values:

- cut down the average tap-to-tap time to 230 min by reducing the

  - repair time by 15 min,
  - charging time by 5 min,
  - time to full melting by 10 min, and
  - refining time by 10 min,

  thus achieving 40 min total cutdown. This converts to raising the daily EAF production from the present 75 tons (in three-shift operation) to 87.6 tons (assuming an average weight of 14 tons per heat)

- cut down the specific power consumption from the present 850 kWh/ton to 800 kWh/ton

- push down the percentage of heats giving out-of-bounds chemical compositions to under 3%

- cut down the electrode consumption rate from the present 9 kg/ton to 7.5 kg/ton

- cut down the consumption of EAF refractories by 3 kg/ton.

Casting ladles. There are three problems:
- ladles are not preheated between heats; cold lining combined with the high thermal conductivity of the high alumina material brings about a considerable temperature drop in the ladle which has to be compensated by tapping the steel at excessively high temperatures. Skulls in the ladles are frequent
- the ladle preparation shop has not enough floor area
- too many ladles are kept in operation at one and the same time.

Above deficiencies can be rectified by

1) preheating the ladles to at least 600°C;

2) installing a second burner for ladle preh ating;

3) using only three ladles;

4) making efforts to homogenize the steel temperature in the ladle; taking measurements.

The objective of above improvements is to attain the following target values:

- cut down the tapping temperatures by 30 - 40°C (as already suggested when analyzing the EAF process)
- cut down the specific consumption of high alumina bricks by 5 kg/ton of steel through extended service life of ladle and tundish linings
- eliminate skulling thus increasing the yield of steel by 5 kg/ton.

Continuous casting. Problems are stated as follows:
- the general assessment of the caster condition is the same as that of the furnace: instrumentation is lacking and considerable wear of the mechanical equipment is evident. Neither the draw-off velocity nor the solidified strand temperature can be measured
- the yield of molten steel is 1,162 kg per ton of billets;

this is roughly 100 kg higher than good standard practice. Strand breakthrough and other casting failures are responsible

- caster capacity can never be fully used with the existing EAF

- billets 100 by 100 mm are kept in store, due to ALAF's inability to find a customer

- the ladle treatment station is out of operation.

Suggested rectification consists in the following action:

General overhaul of the CC facility, plus new accessories. Together with reduced tapping temperatures, this may realistically produce a much lower incidence of failures and a yield of molten steel under 1,100 kg/1,000 kg of billets assuming continuance of the technological practice and stability of chemical composition. At an annual production of 16,000 tons of steel, this converts to nearly 800 tons of surplus billets.

Quality control. Again, quality control is not a major constraint at present, considering that Tanzania is a seller's market. Out-of-bounds heats are much too frequent but can still be sold. Equipment for mechanical testing is available but the share of high-tensile grade where the mechanical values should be guaranteed is low (no more than 20%).

Maintenance. Because of low time utilization, the maintenance problems which otherwise might be prominent are somewhat hidden, but there is a slackness about maintenance, in spite of efforts by management. The EAF door which is kept open during the heat because of a hinge problem and because of absence of a pullrope is an example. Dismantling of caster components will be greatly facilitated by the universal puller/pusher set supplied by UNIDO. The electric instrumentation (also supplied) will aid prevention of electrical failures. It must be remembered that, of course, ALAF has several more Divisions where the maintenance staff can cooperate (e.g., cold strip mill, welded pipe mill).

Training. The expatriate management are very capable, with ample metallurgical expertise, but more training for their local counterparts, to increase their awareness of the problems which e.g. in the area of maintenance is lacking. Again, one of the local managers who has had training in a large steel plant overseas, still lacked practice from a well run mini-steel plant. The following training is recommended: (i) participation in a subregional exchange program where an ALAF shop manager, preferably the present deputy EAF manager, should visit KUSCO to learn better furnace practice and maintenance organization and, at the same time, to share experience from CC which would be

appreciated at KUSCO; (ii) on-the-job training for an ALAF executive in a well run overseas plant of comparable size; (iii) utilization of computer assisted steelworks modeling at the level of NDC, to tackle steelmaking and rolling mill development issues.

Recapitulation of capacity utilization. Present capacity utilization is 59.6% at the EAF shop. However, the fact that in 1988 the utilization was no more than 34% shows that substantial external factors are at play; specifically, this includes shortages of scrap and supplies such as furnace electrodes. Conservative target value that can be achieved without major investment, through implementation of recommendations outlined above, is 70%.

Other recommendations.

- Try to offer to CIFEL the billets 100 by 100 mm kept in store at ALAF. Basically, CIFEL should be able to process this size.

- Pay more attention to personal safety aids (not worn by the furnace and caster crews) and to general tidiness of the workplace.

- Together with SRM, consider alternative means of transport of billets to Tanga. Trucking is expensive and the road is in very poor condition.

C Steel Rolling Mills Limited (SRM)

1. Storage of scrap. It is dangerous and uneconomical to have cobbles and other discards accumulating at the bay and obstructing operations. The first recommendation has been to make provisions to avoid entanglement of rods discarded from the rolling mill. A crew should be detailed to instantly clear away any discards: these must be cut to pieces (long bars must be bundled, short pieces must be filled into drums or crates) stored away to be ready for shipment to ALAF for remelting. The difference between making it irregularly and making it instantly means less involvement of labor, better shop floor utilization, and more regular deliveries of quality scrap to ALAF. Attention has also been called to the necessity of regularly clearing the manipulation area between furnace and mill. This has an indirect benefit of compensating the loss due to generation of discards.

A long term solution to this problem is the project of establishing a melting capacity at Tanga. This would solve several problems at the same time:

- outlet for scrap which is relatively abundant in Tanga and sofar cannot be processed locally
- cutdown of expensive trucking over rough roads
- clearance of discards from the rolling mill bay.

2. Overheating at the reheating furnace; its operation is totally uncontrolled. There is a temperature measuring system but this has no thermocouples. Field measurements by a precision infrared optical pyrometer, taken on three successive days, indicated average overheating by 60-75°C (as against the setpoint of about 1385°C). Consequently, the damage to furnace lining by peeling, bursting, and surface melting of the refractories which brings about a premature shutdown for furnace repair or relining is worth the production of 18 days on the average for a major repair. This converts to 1,480 tons of rolled stock lost (based on 70% over-all capacity utilization). However, the chief loss is indirect and relates to the excessive fuel oil consumption, cf. Problem 3 below. The recommendation has been to rehabilitate the reheating furnace temperature measurement system without delay (using thermocouples supplied by UNIDO) and reduce the furnace input accordingly, while also throttling the smokestack gate.

However, instrumentation is not everything here: the furnace throughput is too low for the capacity of the rolling mill, burners are inefficient, smokestack is very hot indicating after-combustion, and in fact, the entire heating system of the furnace should be redesigned and rebuilt.

It has been suggested that the first step, prior to any rebuilding, should be to conduct trials to find out whether less

than the full complement of burners installed at the reheating furnace need be operated. The optical pyrometer can be used to advantage here. First of all, the side door must be repaired.

The objection that overheating is necessary for the furnace to keep pace with the rolling mill is not valid, because regular if slower rolling cadences are more economical in the long run than operating the mill in bursts.

3. Excessive fuel oil consumption at furnace. Oil leaks around furnace. The average consumption of 99.2 liters/ton of rolled stock was the highest encountered during the mission. The expected good standard consumption rate should be about half this amount, i.e., 50 l/ton maximum. Hence, with the present production volume the mill is wasting 600 tons of fuel in a year. This is a serious drawback which is bound to reflect in the balance sheet. Remedy: see Problem 2 above but also, throttling down fuel oil inputs when the rolling mill is idling, and repair seals and oil lines to stop oil leakages.

4. Mechanical and electric breakdowns. These constitute 27.9 and 11.3% of total downtime, respectively. This converts to approx. 13% and 5.4% of total working hours available (GPT), respectively. Conservative target values for a mill of this kind would be 5 and 2%. Hence, the production lost on this account amounts to 2,500 tons annually (based on 70% over-all capacity utilization). The universal hydraulic puller/pusher set and the electric instruments supplied by UNIDO should be able to pull the mill towards the target values. Also, the Atlas-Copco compressors which control the tilting table of the roughing mill and the cutting shears are in critical condition.

5. Electric instrumentation is lacking. Out of the various electric parameters to be measured, the one which has considerable impact on the reliability of equipment and on maintenance is the insulation resistance of electric motors. The importance of the parameter is underlined by the fact that the company's maintenance workshop does not have the capability of rewinding short-circuited electric motors. The breakdowns that can be traced back to absence of measurements of electric resistance account for as much as 2% of unplanned downtime. This is worth 300-400 tons of rolled stock depending on the over-all improvement reached but, of course, this must be included in the over-all loss due to breakdowns as estimated above (cf. item 4). It is recommended that the insulation resistance meter supplied by UNIDO be used regularly to take measurements of the insulation resistance of all electric motors at the rolling mill. The other electric instruments furnished (digital multimeter, ammeter/voltmeter) can also assist maintenance, not in that it would directly reduce electric failures but rather, in speeding up failure location and identification. Hence, this instrumentation is an important element of preventative maintenance.

6. Shortage of spare parts, tooling, and auxiliary mechanisms. This was alleviated by putting on the list of suggested UNIDO equipment the universal hydraulic puller/pusher set and other minor equipment for maintenance. Conservative estimate of the usefulness of this set of equipment is another 2% of production because of higher performance of the mill, plus energy conservation and labor savings (cf. next item).

7. Billet cutting shears is out of operation. This could never be repaired locally without the universal puller/pusher set mentioned above. Shears out of operation means flame cutting of billets which is poor practice and is expensive because it is energy and labor intensive. The costs of shearing can be estimated to be as low as 10% of the flame cutting costs.

8. No spare hot metal detectors. This is an important element of mill automation, with direct influence on mill performance. New hot metal detectors were put on the list and supplied by UNIDO. The major improvement achieved by this signalling and activating element is improvement of technology and standardization of production (uniform billet length). The loss of mill throughput due to inactive detectors has in this case been estimated to convert to 300-400 tpy.

9. Hard physical labor remains a problem. This problem is particularly pronounced in handling of billets; also, there are no repeaters on the front side of the mill. It is recommended to install repeaters on the front side of the mill (for oval cross sections) where hard physical labor is presently required. Installation of repeaters must also be seen as a significant safety at work factor.

The pusher at the reheating furnace must be repaired, to eliminate manual discharging of billets from the reheating furnace. The recommendation to pay greater attention to safety at work also applies to personal safety aids.

10. Limited reheating furnace throughput. This problem, already urgent, will be even more so as the improvements as per items 2, 6, 7, and 8 are accomplished.

11. Shortage of billets (imports). There are three realistic ways toward improvement: imports from ZISCO, higher production at ALAF, or a CC facility at SRM.

12. Only one crane in the rolling mill bay. If the third shift were introduced, this would not be enough to serve the hot mill (mill changes) and the dispatching of rolled stock from the cooling bed. Consider installing another crane. Also, with a single crane a crane failure will stop the whole mill.

13. Uneconomical transport of billets from Dar es Salaam. Haulage of billets from Dar es Salaam to Tanga by trucks is costly and alternative means of transport should be examined (coastal vessels, railway). It has been recommended that this issue be addressed in a broader context, in cooperation with local port authority and municipal and/or other company interests.

14. Power rationing and outages. This has a significant, adverse effect on production but is outside company responsibility.

Recapitulating, it is clear that items 2, 3, and 4 entail the most significant losses of production, while item 9 is most important for the health and safety of the workers.

Quality control. There is a quality control department, and a laboratory with a tensile tester. Basic measuring tools are available in a limited selection. For the given product mix the quality control routine appears to be satisfactory and is backed by billet producers' certificates. Incoming billets are not inspected for surface quality.

Maintenance. The maintenance people will soon face an entirely new situation given by the commissioning of the wire products section. This will have to be overcome by investment in maintenance apparatus, by expanding the crews, and by training.

Training. There is no expatriate management but the local managers are quite good, with sufficient experience. Training is required in two directions: for standing operations, and for to operations of the new section to be commissioned. The following training is recommended: (i) participation in a subregional exchange program where a SRM shop manager, preferably the present production and technical manager, should visit KUSCO to learn better maintenance organization, better rolling practice, and the operations at a wire products section (about to be commissioned at SRM) while, at the same time, sharing with KUSCO the SRM experience in the area of roll renovation etc.; and (ii) on-the-job training for a SRM executive in a well run overseas plant of comparable size.

Recapitulation of capacity utilization. Present capacity utilization at the rolling mill is 51.7%. A conservative target figure that can be achieved without major investment, through implementation of the recommendations and measures outlined above, is 60%. Beyond this, there are considerable reserves in the supply of raw material (billets); this is a matter of future development.

D Companhia Industrial de Fundicao e Laminagem S.A.R.L.

The problems faced by CIFEL are grave, long-term, and serious. At a general level, they are broken down and analyzed below:

1. Shortage of raw materials. This is the paramount problem for CIFEL, due to a shortage of forex and aggravated by logistical problems. A temporary relief can be obtained by adding other sources of raw materials to the one from ZISCO; one such source identified by the mission is a stock of billets 100 by 100 mm available from ALAF (SRM cannot use them but CIFEL could, at their bar mill).

2. Irregularities of power supply. Again, there is very little the company can do about it.

3. Low and decreasing volumes of production, inadherence to annual production plans. Inefficient production. This is the result of 1) and 2). The recommendation is not to rigidly adhere to three-shift operation but rather, to concentrate production in periods less likely to be affected by power disturbances. However, the technical aspects here must not suppress an awareness of the social aspect: the three shifts, even at extremely low capacity utilization, provide a degree of social security and stability to the workforce.

4. Poor yield of billets. The very low yield being achieved is of course due to very low output. If the effect of the recommendations made here can be combined with a higher and more stabilized level of production, the yield can be expected to rise dramatically.

5. The high fuel oil consumptions can be remedied in the same way. However, reconstruction of the draft conduits is a pre-requisite. The achievable target is 50% of present consumption, considering the condition of the furnaces.

6. Poor condition of the production equipment. This applies both to the bar mill and to the wire rod mill; the wire rod mill is the worse of the two. Principally, this is a matter of future rehabilitation and development but even now, several improvements were suggested. The recommendations made are as follows: (i) Repair/replace loose and worn guides at both rolling mills. (ii) Intensify water cooling of roll grooves on the bar mill - direct the water sprays onto the working area of the rolls. (iii) Repair and, later, rehabilitate the number 1 intermediate train of the wire rod mill which is in very poor condition, undersized, and badly corroded. (iv) repair tilting table of the roughing stand of bar mill which is in critical condition; replace mechanical drive of which the gearbox is badly damaged by a pneumatic drive. A hydraulic drive is not recommended because of oil leakages and danger of fire.

7. Reheating furnace at the bar mill is in poor condition, lacks instrumentation and thermocouples, and is being overheated. This constraint can be overcome by installation of a temperature measuring system and of Pt/PtRh thermocouples supplied by UNIDO, and also by independent temperature measurements using an optical pyrometer (also recommended). The side burners at the two reheating furnaces (at the bar mill and the wire rod mill) need repair. During the team's visits, both furnaces were stripped of temperature controls and only the wire rod mill furnace had a temperature indicator. The draught conduits are so designed that the furnace pressure cannot be controlled.

8. Billet temperatures (at bar mill) and melt temperatures (in foundry) are not measured. An optical pyrometer was recommended as indispensable for stabilization of the production practice.

9. A reliable hot metal detector was recommended for the wire rod mill, to activate the cutting shears ahead of cooling bed. This is expected to reduce the percentage of rejects in this area. This cannot be quantified easily because of the extremely low average utilization of the mill, but is a necessary condition for a proper operation of this part of the mill.

10. Entangled rejects from rolling mills. These keep accumulating and are coped with by flame cutting only which is inefficient. It has been recommended that measures be taken to get rid of heaps of entangled rods and wire discarded from the rolling mills, using manpower kept idle during shop shutdowns and power outages. To facilitate this labor, a portable hydraulic shears was recommended.

Quality control. There is little quality control except for dimensional checking of bars and rods. The rolling mills rely on the billet suppliers' certificates. A range of simple measuring devices were put on the list of UNIDO supplied equipment, together with the optical pyrometer which also is a tool of quality control.

Maintenance. The maintenance workshop has problems with electric welding and cannot take electrical measurements. The equipment and instrumentation recommended include a universal hydraulic puller/pusher set, an insulation meter, a digital multimeter, an ammeter/voltmeter, and an electric welder.

Buildings are in considerable disrepair; consider putting the shop crew on the job of repairing them while the mill is idle. Also, these people could cut the scrap heaped up outside.

Roofs are leaky; there were repeated cases of damage to the main drive motors because of rainfall combined with irregular operation. This put the shop out of operation for several months.

The insulation meter was ordered by UNIDO specifically for checking the insulation resistance of the electric motors to prevent serious damage. Uncontrolled ingress of water appears to be a general problem, because water was also detected in the finishing block oil tank of the wire rod mill.

High contents of chlorides and mechanical impurities (scale) in cooling water are responsible for the low service life of slide bearings. Many parts of the mill are badly corroded.

It has also been recommended that
- the reconditioning of crane wheels could be done locally;
- the instruments supplied by UNIDO be used to measure the insulation resistance of electric motors;
- the same instruments and tools be also employed to increase the low utilization at the mechanical workshop;
- the range of farming machinery produced at the mechanical workshop be expanded; this could enhance the over-all capacity utilization;
- an engineering designer should be consulted to assist in the design of farming and other implements.

Training. There is a high share of unskilled labor and only one graduate engineer at CIFEL. At the managerial level, training is required in the following specific areas:

(i) utilization of computer assisted steelworks modeling (preferably with the rolling mill manager or the finance manager participating) because of the need to assess and reassess, under serious and changing external constraints, the development and rehabilitation plans;
(ii) participation in an exchange program where a CIFEL development manager should visit SRM (mainly to exchange experience relating to developments such as the wire mill and secondary products section) and a maintenance manager should visit ZISCO (to take part in the ZISCO maintenance training program);
(iii) on-the-job training overseas for a shop manager in a well run mill of comparable size.

Recapitulation of capacity utilization. Present capacity utilization figures at the bar mill and the wire mill are abysmal: 13.7 and 10.5%, respectively. Conservative target figures that can be achieved without major investment, through implementation of the less demanding recommendations and measures outlined above, are of the order of 5-10%. An over-all improvement of maintenance and production practice would be the chief components. However, external factors outside company control play a dominant role here; chronic shortages of billets and power are dominant.

E DESBRO International Limited

1. Change of inputs. Small-size billets (60 by 60 and 80 by 80 mm) are expected to be no longer available. Remedy consists in adapting future development so that the mill could accept 100 by 100 mm billets.

2. Output constraints. The speeds of the intermediate and finishing stands are too low resulting in a limitation of output when rolling 8 mm dia. rebars (which is dominant product). Again, this is a matter to be handled by future development.

3. Furnace overheating; temperature measurement and controls missing at the heating furnace. A reheating furnace temperature measuring system and an optical pyrometer were recommended. The chief benefits are reduced fuel oil consumption (estimated at 5 liters/ton), reduced loss of steel due to scaling (by min. 10 kg/ton), and longer service life of refractories.

4. Excessive sticking of billets to the heating furnace hearth resulting in severe wear of the hearth (also see item 3). Electromelted refractory for relining the bottom of the pusher furnace was recommended and its supplier was identified.

5. Hard labor and labor intensive operations. Manually operated roughing mill and manual billet transport from the furnace involve hard and dangerous physical labor, and so does the cooling bed operation. This again can only be remedied by future development.

6. Hot metal detectors. Cutting shears downstream of the finishing stand must be actuated manually as there are no reliable hot metal detectors to re-activate this cutting shears and also to keep operating the shears downstream of #3 stand.

7. Filekeeping problem. There is no apparatus which would count and/or record the volume of production. To avoid disputes regarding the number of billets rolled, it has been recommended that the signal from a hot metal detector be employed for automatic counting of the pieces passed through the rolling mill so that exact filekeeping is introduced. This is an effective solution in conjunction with e.g., a Kienzle recorder (for keeping permanent records).

Files should be kept on the yield of steel, the specific consumption of fuel, and the frequency and types of mill breakdowns, to raise the utilization of the mill.

8. Cutting of cobbles. There is no shears to cut scrap and rejects effectively. Scrap generated at the company is sold (exported). A portable hydraulic shears was put on the list of

UNIDO supplied equipment.

9. Alternative product mix. It is worth considering the production of channels and angles (which now are imported as-rolled) by cold forming from strip. More intricate shapes could be introduced later.

Quality control. Attention is paid to quality control, to a degree sufficient for the present product mix. There is a laboratory with a tensile tester. Complaints were voiced as to the quality of ZISCO billets (variability of mechanical properties and chemical composition).

Maintenance. The mechanical workshop is equipped with machines which are rather old. As in most mini-mills of the area, the ribs in roll grooves are manually ground. There is little room in the workshop and poor lighting. The gases from the forge shop affect the working environment in the workshop (the workshop serves not only the rolling mill but also the PVC pipes production plant).

For improvement of maintenance, essential electric measuring instruments were supplied, as well as a universal hydraulic puller/pusher set to ease dismantling of equipment and mill changes.

There is little room in the mechanical workshop, and poor lighting. The gases from the forge shop affect the working environment in the workshop.

Training. The managers are quite good, with sufficient experience and with enough of an understanding of the present and future needs. The rolling mill manager has had foreign experience. The following training is recommended: (i) participation in a subregional exchange program where a DESBRO manager should visit KUSCO to share technical as well as managerial experience in the areas of maintenance organization and rolling practice, and also to learn the operations of a wire products section to germinate ideas on future development; (ii) on-the-job training for a DESBRO executive in a well run overseas rolling mill of comparable size workshop.

Recapitulation of capacity utilization. Present capacity utilization at the rolling mill is 64.7%. Inasmuch as the 8 mm bars are the dominant product size, it is essential to speed up the mill in order to remove the main output constraint. Also, improved filekeeping should be able to analyze mill stoppages and to identify sources of potential improvement. Comparisons of hourly rolling rates indicate reserves because with the labor intensive operations, the rolling cadences tend to be irregular. Taking the positive aspects of the present operations into account, DESBRO should be able to aim at a target figure of 70%; this can be achieved without major investment.

F Ship Breaking & Rolling Industries Limited

The problems faced by the Company[4] can be broken down as follows:

1. Difficulties to break even financially unless production is raised. Efforts to improve time utilization at the mill can in principle take two routes: (i) the route of extending the working hours which faces organizatorial constraints, and (ii) the route of streamlining the operations which faces technical obstacles insurmountable without major investment (cf next paragraph). Moreover, the sales situation has become more complicated because of expiry of a product mix specialization agreement with DESBRO, and is bound to be even more constrained as soon as the effects of the short term rehabilitation projects of the other two local rolling mills become felt.

2. The mill being housed in a bay of light construction, with no overhead crane, the dismantling of stands is assisted only by a hoist suspended from a beam running over the stands; it is very difficult and unwieldy to manhaul the rolled stock away from the cooling bed and from the rolling mill area. Mill changes take too long: a complete roll change takes two to three days, and the change of repeaters takes one shift. As a rule, the mill changes are connected with clearing away the finished rolled stock from the bay which again is done manually. All this is labor intensive and is a major constraint to capacity utilization. Production has to stop when the storage area within the bay is full. An effort has been made to alleviate the mill change and maintenance aspects of this situation by recommending to UNIDO the purchase of an universal hydraulic puller/pusher set for the mill, primarily to speed up mill changes.

3. Mill management are thwarted in their attempts to switch to two-shift operation by manpower problems. This relates to the labor intensiveness of the process and also to differences in pay where the management cannot afford to compete with wages offered by the neighboring mill.

4. Temperature measurement and controls missing at the heating furnace; smokestack damper inoperative. The associated high fuel oil consumption of up to 120 liters/ton (in case of 8 mm rebars) makes the heating costs about twice as high as those of DESBRO. Throttling down fuel oil inputs when the rolling mill is idling represents only a limited help. The prerequisite of real improvement is a temperature measuring system on the furnace (provided by UNIDO). This would cut down production costs thus assisting the company in their effort to approach the break-even point, but would not substantially increase production because

---

[4]The company had to suspend operations in 1990.

the major bottleneck of throughput is not at the reheating furnace. The optical pyrometer is also very useful in improving the heating practice. Avoidance of furnace overheating thanks to the equipment supplied ought to improve furnace control and reduce fuel oil consumption by 20-30 liters/ton. Reduction of the loss of steel due to scaling is estimated to be no less than 10 kg/ton.

5. Excessive sticking of billets to the heating furnace hearth resulting in severe wear of the hearth. This is yet another consequence of furnace overheating. On-the-spot assistance on this point was provided by passing on comprehensive information.

6. Uneven billet lengths. These are necessary because of limited possibility of cutting the blanks along the rolling mill train. The furnace is narrow and has only two skids spaced at 700 mm from one another; consequently, short billets cannot be processed. This involves wastage. Installation of one or two more skids should be examined.

7. An additional cutting operation is required after the #3 pass when rolling small sizes (at the outlet side of the roughing stand). Again, this involves wastage.

8. The semi-mechanized rolling mill involves hard physical labor and dangerous exposure; the roughing mill is manually operated. Cooling bed operation also is very much labor intensive (manual handling of rolled bars). All this contributes to manpower problems (cf. item #3 above).

9. The cooling bed is a weldment not attached to any foundation and must be moved when the last mill stand is not used; the rolls have little clearance above ground so the cooling bed cannot have any bundle collecting bin.

10. Electric motor failures. An insulation meter, digital multimeter, and ammeter/voltmeter were recommended for preventative maintenance.

11. Small-size billets (60 by 60 mm) may become unavailable in the near future and the mill as it stands cannot accommodate bigger billets.

12. There is shipbreaking equipment but no shipbreaking activity. It has been recommended to consider reestablishing the shipbreaking operations discontinued 10 years ago. The first key to this problem is to try regaining access to a shipbreaking jetty. If this is not viable the company should get rid of specialized shipbreaking machinery.

13. Useless old mill. Again, if there is to be no more shipbreaking the idle 9" rolling mill (formerly used for rerolling bars from shipbreaking; not operated since 1980) should

be scrapped or sold. As a matter of fact, scrapping it may prove to be the only possibility. This will give the Company a bay equipped with rails for overhead crane, for effective rolling mill operation or some other activity.

14. Tidiness of the workplace suffers from heaps of entangled discards outside the bays. This also is a safety hazard. The portable hydraulic cutting shears supplied by UNIDO can be used to clear this away effectively. Joint usage with DESBRO was recommended.

Priorities. From the point of view of the company future, items 2, and 3 represent the main constraints responsible for the unfavorable situation outlined in 1. Mauritius being a small island, it represents a highly competitive environment in the area of steel rebar production.

Quality control. There is no laboratory. The mill relies on the billet manufacturers' certificates. Documentation for roll groove machining is in poor condition. Ribs in the finishing pass grooves are manually ground. Samples are takes twice a week and sent to the Mauritius Bureau of Standards for tensile testing. All this however does not present a very serious constraint to marketing the present product mix.

Maintenance. The mill change taking three days, the universal puller/pusher set supplied by UNIDO should cut down the stoppages considerably, because of easier dismantling and assembling.

Training. The mill manager is an excellent organizer but lacks technical education. This manager would greatly benefit from (i) participation in a subregional exchange program where he would best visit KUSCO to gain a deeper technical understanding in the areas of maintenance and rolling practice; and (ii) on-the-job training in a well run overseas rolling mill of comparable size.

Recapitulation of capacity utilization. Present capacity utilization at the rolling mill is 41.3%. Calendar time utilization is low, too. Mill layout and related material handling and maintenance problems are source of constraints insurmountable without a major revamping. Mill delays involved in clearing the rolled stock from the production area are considerable, too. Expiry of the product mix split agreement also is having an adverse effect. Nonetheless, implementation of the recommendations made should bring the mill to a level of about 50% capacity utilization. Keeping the working rhythm is the greatest single opportunity to raise capacity utilization but of course, this is difficult to do because of the labor intensiveness involved.

G Sections Rolling Limited

The problems of the mill were discussed with management and the stages of the ongoing rehabilitation and upgrading program were reviewed.

The specific problems faced by Sections Rolling Ltd. include:

1. Low demand on local market for given product mix; consequently, the necessity of operating one shift only, even if at a high time utilization. The recommendation is to re-check the supply and demand situation in Mauritius with a view to the development plans of Desbro focused on small sizes of rolled stock, also taking into account that the sister company the Ship Breaking & Rolling Industries suspending operation.

2. Low throughput of standing reheating furnace. This is being taken care of by the mill upgrading program (to commission the new reheating furnace).

3. Absence/poor condition of temperature and combustion controls on the furnace. The company should put to best possible use the instrumentation and auxiliary equipment originally intended for the weaker sister company the Ship Breaking & Rolling Industries Ltd. Especially, use the temperature measurement system supplied by UNIDO until the old furnace is replaced.

4. Billet length constraint. The necessity of charging different billet lengths because of the length of the cooling bed and because of mill design constraints imposes a limitation on the mill. This will improve as soon as the present stage of the upgrading program is completed.

5. Billet size constraint. Small size billets (60 by 60 mm) will be difficult to obtain. This is a situation faced by all the Mauritius rolling ills.

6. New stands waiting. The obvious recommendation is to increase mill output and to expand product mix by installing new stands already on site.

7. Hard physical labor (mainly, in material handling and hauling) due to low degree of mill mechanization (especially, labor intensive operations around the cooling bed). Again, this will improve as per item 4. The universal puller supplied by UNIDO should facilitate the assembling and dismantling operations during mill changes and repairs.

8. It is imperative to look into the export potential, particularly within the PTA, to justify long range development

plans (80,000 tpy produced in two-shift operation cannot realistically be sold within Mauritius).

Quality control. As in the other rolling mills in Mauritius, the level of quality control is commensurate with the market requirements and relies to a high degree on the billet manufacturers' certificates and a stabilized rolling practice. There is no laboratory. Random tensile testing is done by sending samples to the Mauritius Bureau of Standards.

Maintenance. The production specialization of the mill facilitates maintenance. The mill has a high share of manual operations - there are no repeaters etc. so that maintenance is not complex. The new stands and reheating furnace about to be installed will be a decided advantage.

Training. While the mixed expatriate and local management is at a high technical level, with foreign experience and with clear ideas about mill possibilities and future development plans, it would be beneficial for the company to be take part in (i) a subregional exchange program involving KUSCO and (ii) on-the-job training overseas, preferably in a rolling mill of which the product mix would include bars, flats, and sections. As concerns participation in the steel mill modeling workshop, the same recommendation applies as has been made to Ship Breaking & Rolling Industries.

Recapitulation of capacity utilization. Presen utilization of the working hours available at the rolling mill is 72.0% but it must be borne in mind that this is only one-shift utilization. With a single shift, calendar time utilization of course is low. However, the market for given product mix is limited and switching to two-shift operation would require product mix expansion. This is why, after completing the short term development program, it will become feasible for the first time for Sections Rolling Limited to introduce the production of sections, as the only mill in Mauritius, thereby greatly enhancing the over-all capacity utilization.

IV. FUTURE EXPANSION AND REHABILITATION

A Kenya United Steel Company Limited

The obvious main development will be the installation of the continuous casting machine which has been on site since 1982 but still in crates. The foundation have been constructed awaiting the equipment installation.

This machine with a radius of 4 meters was ordered from Concast of Zurich but manufactured in Italy. It has one strand but has provision for a second and is supplied with moulds for 80 mm x 80 mm billet. The machine has the capability of casting up to 130 mm x 130 mm billet.

The new equipment has been designed for KUSCO's present ladle size, but could accept a larger ladle. A change to a slide gate practice from the present stopper rod is proposed to coincide with the new caster.

The tundish has 3 tons capacity but is initially divided in two to minimize refractory until the second strand is added. It is planned to use cold board linings.

The billets are cut to length by a mechanical shear before being discharged onto a cooling bed.

At the rolling mill, Danieli of Italy suggested an upgrading program which would involve a new pusher furnace (8 m, 25-30 tph), a six-stand continuous roughing (dia. 420 mm), flying shears, a six-stand fast finishing block (750 kW d.c. with 11.2 mm starting dia., range 5.5-10 mm finished stock; 30 m/s exit velocity, loop layer with controlled cooling along the conveyer) to make wire rods. This was proposed in September, 1989 and was characterized as costly by KUSCO management.

Suggested implementation:

On the basis of available information, the installation of the new CC facility would be of little benefit as long as the mill would continue turning out the same plain carbon grade it produces today: the enhancement of the steelmaking shop capacity would not be substantial enough and the unit costs would not decrease substantially either. Most of the real advantages of producing continuously cast billets would only be realized in the rolling mill but it is a marginal case.

The reasons are as follows:

- the low weight per heat and the impossibility of pouring more heats in succession prevent any marked improvement of steel yield as against pouring the pencil ingots

- the present process would have to be modified to upgrade quality and homogeneity to a level required in a CC facility. Such process modifications would entail longer tap-to-tap periods

- a CC crew is required

- the higher quality of production will find little appreciation in the present market.

A study should be conducted to ascertain the present costs and profitability of erecting and operating this CC with a view to over-all benefits for the company (i.e., including the rolling mill). Specifically, it should be decided

(i) whether or not to erect the caster now
(ii) who should supervise erection and commissioning (local expertise not being available).

- In connection with the installation of caster, it should be decided whether to cast strands up to 80 by 80 mm maximum (with no additional requirements on the rolling mill but with possible difficulties at the caster facility, because of the rather small cross section), or whether to prefer a caster modification allowing the casting of higher cross section strands (more advantageous for the caster operation proper but involving necessary modifications at the roughing stand of the rolling mill, or the inclusion of a new, more powerful roughing mill).

The basic contradiction is that the CC would have a relatively high throughput, as so would the new or reconstructed rolling mill, whereas the EAF capacity would remain a bottleneck unless a solution is found to the power cost problem; only then would it be possible to build a bigger EAF. Again, bigger EAF would need considerable changes to the over-all design and layout at the steelmaking shop. This is a clear-cut case for an optimization study, because of the number of possible variants and the need of a subtle balancing of capacities. Such a case of marginal payback should be treated by a computer model, in spite of this being a small mill. It is exactly for such cases (also encountered at NDC, at CIFEL, and in Mauritius) that the use of the World Bank co-sponsored steelworks evaluation modeling has been proposed.

B Steelcast Division of Aluminium Africa Limited (ALAF)

There has been no investment into ALAF in recent years but the development plans are well-defined.

With a view to projected demand for steel and steel products, there is a wide scope for expansion and modernization at ALAF for the 1990-1995 period. At the level of the Steelcast Division, the major expansion items planned are an additional electric arc furnace, a bigger billet caster of 40,000 tpy capacity, and a section mill. At present with ALAF having no rolling capacity, the ALAF billets are rolled to bars in the SRM rolling mill at Tanga. The section mill at ALAF will be producing bigger size sections which are not manufactured by SRM.

A shipbreaking project is also entertained by ALAF.

Recommended implementation:

1. Major/general overhaul of standing EAF. USD 2-3 mln, 1992. This is seen as a reasonable first component of a stepwise rehabilitation program. If upgraded, the overhauled furnace would turn out all steel required to cover the present capacity of the CC and also of the SRM rolling mill, thus eliminating a forex constraint constantly encountered when purchasing billets abroad. This of course would benefit SRM directly and ALAF indirectly. The overhaul would have to entail the installation of a more powerful transformer and of intensification elements (oxygen lances to speed up melting and refining).

2. General overhaul of standing CC. USD 1-2 mln, 1992. This should go hand in hand with EAF overhaul since either will cause general shutdown of the plant. Part of the overhaul would have to be modification to allow sequential casting. The objective is to reach a capacity of 40,000-50,000 tpy for 100 by 100 mm billets.

3. New EAF at the melting shop. USD 5 mln (approx.), 1995-1998. At 25,000 tpy capacity this should be of design not too different from that of the old EAF, and would provide the boost necessary to eventually feed a reconstructed caster without significant constraint on either the furnace side or the caster side. It would make little sense though to construct a new furnace unless the section rolling mill project is approved (cf. item 5 below). An even more important prerequisite is to find a satisfactory solution to the scrap shortage problem. Again, at 40,000-50,000 tpy new EAF capacity this would satisfy the requirements of the ALAF rolling mill to be built but might still constrain the standing SRM rolling mill. Also, a large furnace would require a new melting shop bay at ALAF.

4. New billet caster. This variant is regarded as only the second best at present because the reconstruction of the standing caster will yield the capacity required, at a more economical cost. The problem is however whether there will be anybody willing to do the reconstructing.

5. Section rolling mill 36,000 tpy capacity. USD 8 mln (approx.), 1995-2000. This would make ALAF and SRM more independent of one another, would end the haulage of billets, but might end up constraining SRM because there would not be enough capacity at ALAF for own rolling mill and for billets for SRM at the same time.

6. Shipbreaking facility. An independent study is available from Kamdar Dalal & Associates, Bombay, India.

C Steel Rolling Mills Limited (SRM)

The plans for SRM, Tanga had to be modified considerably, due mainly to the general setback in the early 1980s, but now as before they have as their prime target the commissioning of the Drawn Wire and Secondary Wire Products plants.

The presently entertained development projects have been worked out to considerable detail. According to TISCO, the demand for rolled products in Tanzania is over 230,000 tpy in 1990, with a 10% increase expected every year. This includes the wire needed for the fabrication of fences, wire mesh, barbed wire, nails, screws, and bolts. The projects for starting up the wire mill and wire products section should be reassessed and the best project speedily implemented without further delay, seeing that misjudgment of the viability of earlier commissioning projects has already cost the company a considerable share of production. The project proposal presently considered is by Danieli & C. SpA of Italy who are the logical partner having supplied the shop equipment. The proposal comprises delivery of missing components, final erection, commissioning, and spare parts for 2 years. The entire project would then be to the tune of USD 12.5 mln, of which USD 7 mln is to be a grant by Italian Government, 2.6 mln is to be invested by SRM, and 2.8 mln is to be contributed by Incontra Commerce and Financing Co. Ltd. of Salzburg, Austria. The financing scheme may undergo some changes still, but the contract has been signed.

Shop operations are expected to start late in 1991, gradually picking up until the full operating range is reached by 1994. The design capacity is 18,000 tpy of wire rods. Hence, the final situation should be two parallel mills, the one being the present rod mill (partially rehabilitated) making round bars from billets, and the other being the new wire mill turning out 9,900 tpy of wire products.

According to latest analyses for the 1990-1995 period, the capacity of SRM on completion of the rehabilitation and expansion projects in the rolling mills are will be as follows:

Old mill	30,000 tpy
Wire rod mill	36,000 tpy
Wire products	11,000 tpy
Bolts and nuts	1,000 tpy
TOTAL	78,000 tpy.

Recommended implementation:

1. Completion and commissioning of the wire mill and wire products section. USD 12.5 mln total costs, 1991 (with production

picking up until 1994). The scheme outlined above is strongly recommended because of

- linkup with previous installation
- high demand for the wire products
- adequate financing
- bridging the inactivity gap which inevitably, would reduce the equipment already installed to scrap within a few years.

2. Bar mill rehabilitation to 30,000 tpy capacity, 1992-1995. This involves mainly a new reheating furnace, plus rolling mill train revamping (but not any new rolling mill stands) worth USD 3 mln. A second crane should be installed.

3. New EAF melting shop of 10,000 tpy capacity (1996-2000). This relatively modest project involving a 4-ton or 5-ton furnace would take care of available local scrap, would alleviate the transport situation, and would make SRM less dependent on purchased billets. Second-hand, reconditioned equipment can also be considered. Estimated costs: USD 6-8 mln.

4. New EAF melting shop followed by a billet caster of 70,000 tpy capacity (1996-2000). This development, entertained by NDC, cannot be recommended until and unless

- the pattern of inputs, markets, and demand is established by a thorough, independent study
- the immediate project of wire mill commissioning is successfully completed
- it is proved that this would be superior to expanding the production at ALAF while continuing the shuttling of billets from ALAF to SRM by road or whatever cheaper alternative route.

D Companhia Industrial de Fundicao e Laminagem S.A.R.L.

CIFEL's modernization and rehabilitation plans include major projects such as revamping of the existing wire and bar mill, erection of mini-steel shop with a CC caster, revamping and modernization of foundry and mechanical workshops, and installation of new drawing machines, but also relatively modest projects such as installation of an induction furnace and the establishment of a training center.

It has been estimated that after implementing the ambitious rehabilitation and modernization program, CIFEL will be in a position to produce

- 80,000 tpy of finished hot rolled products
- 8,000 tpy of cold drawn wire
- 4,500 tpy of steel, iron, and non-ferrous castings
- 2,500 tpy of machined parts and steel structures.

The low production of steel in Mozambique is a pressing problem which is aggravated by the generally low capacity utilization at CIFEL. All long term development is contingent on the country overcoming the generally unfavorable economic situation.

CIFEL management's own view of the rehabilitation and expansion needs is as follows:

Foundry:
- To reach the molding shop capacity.
- To increase the sand preparation capacity.
- To mechanize the sand transport system.
- To improve the quality of castings through modification of the casting system.
- To install an induction furnace of 1.5 to 3 tons capacity.
- To secure instruments for the laboratory.

Rolling mill:
- To modify the bar mill so as to allow for the production of sections.
- To modify the rod mill technology so as to increase the finishing speed from 14 to 23 m/s, to boost productivity.
- To install two drawing machines at the drawing mill to reach a capacity target of 6,000 tpy (producing wire 8 mm and up).

Machine shop:
- To increase the capacity of machining to boost the output of mill rolls from nodular iron, to upgrade repair work and manufacture of spares.
- To secure instruments and apparatus for quality control.

General:

- To establish a training center to provide training in foundry, rolling mill, drawing mill, and machining technology.
- To establish a social center for the workers.

Suggested implementation:

The major problem of development is the thwarted long-term development plans and uncertainty about further development due to shortage of funding and of foreign currency, and also due to external constraints of the country which are outside company control.

CIFEL's rehabilitation plans are now being given a chance at success, with a foreign aid package coming from Spain which should also address the problems of the steel industry.

The modernization and rehabilitation of CIFEL has already been the subject of numerous studies and consultations. The major projects planned include revamping of the existing wire and bar mill, erection of mini-steel shop with a CC caster, revamping and modernization of foundry and mechanical workshops, and installation of new drawing machines, but also relatively modest projects such as installation of an induction furnace and the establishment of a training center. One project which would be of considerable importance to the plant's future is the installation of a closed loop water circulation system; the chloride contaminated water presently used throughout the plant has very damaging effects.

It appears to be necessary to reassess the projects aimed at erection of mini-steel plant, rolling mill revamping and modernization (both bar mill and wire rod mill); modernization, revamping, and overhaul of foundry and mechanical workshop, rehabilitation and modernization of wire drawing shop, and erection of new, closed cooling water circulation system, in view of the foreign aid package of which CIFEL should be one of the beneficiaries. The reassessment should take into consideration a realistic estimate of the trends to be followed by the external constraints. Availability of raw materials and power is essential for otherwise the effectiveness of all development work and rehabilitation would be uncertain.

E DESBRO International Limited

At DESBRO as a private company, the present high rate of demand for rebars is encouraging for a stepwise implementation of expansion projects.

The present layout of the mill constrains the location of the new roughing stand. The short term projects aiming at speeding up the train and installing a new roughing stand are already in progress and both the drives and the roughing stand can possibly be installed before the end of 1990.

Long term expansion plans involve considerations to install a melting capacity.

Recommended implementation:

1. Go ahead with installation of new roughing mill so as to speed up the mill train (1990-1991). The roughing stand must be so designed as to accommodate 100 by 100 mm billets and to eliminate hard labor. New pass design must be elaborated.

2. Having increased the speed of the mill by about 40%, pay attention to modernization of the cooling bed which otherwise would become the bottleneck and would keep labor costs high. A mechanized rack-type cooling bed should be installed (1991). Make use of KUSCO and possibly SRM experience.

3. There being no producer of sections (channels and the like) in Mauritius, give serious consideration to the project aimed at introduction of a cold rolling/forming capacity where steel sections would be produced from imported strip.

4. DESBRO being an exporter of own as well as collected scrap, the installation of an induction furnace should be considered. This could be a low-cost, small furnace (1 ton capacity) easy to install. Scrap could be remelted in this furnace which would turn out castings; this would require a marketing study.

5. This would be a viable alternative to the installation of an EAF for the production of feedstock for the Mauritius rolling mills; the sources of scrap being limited and there being no shipbreaking operations at present, an EAF appears to be a more distant possible development.

6. In every case, consult and possibly coordinate development with Sections Rolling Limited, to avoid overcapacity in Mauritius and to maintain a reasonably high capacity utilization. Export possibilities, preferably to the continental PTA countries where rolled stock is in short supply, should always be borne in mind.

F Ship Breaking & Rolling Industries Limited

Ship Breaking & Rolling Industries may consider re-opening as soon as the ways and means to implement the recommendation made in Chapter II are found. However, reactivation of shipbreaking is contingent upon re-allocation of a jetty by the Government, and would also require some melting capacity to be effective.

G Sections Rolling Limited

The 1990 selling price of 9,500 to 10,000 MUR per ton of rebar provided a good margin encouraging expansion plans.

After the second stage of mill upgrading in 1985, the third phase is underway: this will consist in the commissioning of a new reheating furnace (already on site) equipped with adequate temperature controls and measurement, and the installation of a two-stand finishing train giving a higher exit speed.

Implementation of this, already on-going mill upgrading project will considerably enhance heating accuracy and thus, product quality; it will reduce fuel consumption and billet scaling. There will be no problem switching to larger size billets. Also, it will increase the company's chances to enter the small sections market.

Long range plans focus on possible installation of a hot rolling mill having a capacity of 80,000 tpy assuming two-shift operation. A proposal by Danieli of Italy for a new facility is being examined.

In the short term, the obvious course to take is to implement the instrumentation and equipment taken over from the sister company. This will mainly serve to alleviate the reheating furnace bottleneck.

In the longer term, the mill expansion program is technically well conceived and developed. The UNIDO team approves of the plan. However, the implementation schedule of stage 3 upgrading clearly depends on market development. All necessary equipment has been on site for considerable time.

The implementation of the long range scheme (new hot rolling mill) could also take the route of securing reconditioned equipment, either a complete line or a complete section such as roughing mill, mechanized cooling bed, etc., to decrease the capital outlays. Clearly, an activity in exports is one of the prerequisites for implementing this large project.

IV. REVIEW OF EXPANSION AND REHABILITATION PROJECTS

Short term (1990-1995), medium term (1996-2000) and long term projects are reviewed.

Production of iron

1. iron ore restructuring project (including sinter plant), long term (ZISCO)
2. COREX direct reduction facility, long term (ZISCO)
3. exploitation of potential iron ore reserves, long term (Kenya Government)
4. Liganga iron ore project, long term (Tanzania Government)
5. exploitation of iron ore reserves, long term (Mozambique Government)

Steel melting

1. caster installation, short term (KUSCO)
2. EAF shop expansion, long term (KUSCO)
3. EAF shop expansion (installation of additional electric arc furnace), short term (ALAF)
4. new billet caster of 40,000 tpy capacity, medium term (ALAF)
5. new billet caster of 70,000 tpy capacity, medium term (SRM)
6. new billet caster, medium term (ZISCO)
7. installation of an induction furnace, short term (CIFEL)
8. foundry rehabilitation, short term (CIFEL)
9. mini-steel shop with caster, long term (CIFEL)
10. EAF or induction furnace, medium term (DESBRO)

Rolling of steel

1. rolling mill expansion, long term (KUSCO)
2. new section mill (36,000 tpy capacity), medium term (ALAF)
3. bar mill rehabilitation to 30,000 tpy capacity, short term (SRM)
4. commissioning of wire rod mill and drawn wire/secondary wire products plants (to 36,000 tpy and 12,000 tpy capacity, resp.), short term (SRM)
5. finishing mills, medium term (ZISCO)
6. wire and bar mill rehabilitation, short term (CIFEL)
7. new drawing machines, medium term (CIFEL)
8. bar rolling mill expansion (including new roughing mill), medium-to-long term (DESBRO)
9. cold rolling mill, long term (DESBRO)
10. sheet rolling mill, short term (ZISCO)

Other

1. continuous galvanizing line (coil-to-coil), short term ALAF)
2. shipbreaking, short term (ALAF)
3. shipbreaking, long term (Ship Breaking & Rolling Industries)
4. expansion of Pipeco Division (to the production of bigger size pipes), short term (ALAF)
5. annealing plant of 13,000 tpy capacity, short term (ALAF)
6. color coating plant at Galco Division (10,000 tpy capacity), medium term (ALAF)
7. production of high-alloy steel, medium-to-long term (ZISCO)
8. training center, short term (CIFEL).

ROLMIL KENYA LIMITED

by
B.S. Prasad, Manager
Rolmil Kenya Limited

Rolmil Kenya Limited had been established in 1979 with a view to cater for the needs of steel fabricators, building constructors, etc., in Kenya seeking for quality products. Since its inception to date the products, specially profiles, have earned confidence in the market. Rolmil Kenya Limited is a member of Kenya Bureau of Standards.

ROLLING MILL EQUIPMENT

The mill is equipped with 11 inch three high seven stand mill run by a 800 HP motor; pusher type reheating furnace with a capacity of 4 tons per hour; a suitable roll turning machine shop, straightening machine, bar-cutting machine, twisting machines, billet shear, etc. From 1979 to 1986 the main raw material for the mill was billets which were imported.

With a view to develop local skills and save the country's precious foreign exchange, the management decided to put up an electric arc furnace which would consume locally generated scrap as basic raw material, with a view to achieve self-sufficiency, to provide training to local personnel, to boost up employment opportunities, the company went ahead with the project and installed a 6 ton electric furnace by the end of 1985. Since then, the company is manufacturing its own bottom poured ingots to feed the rolling mill.

In early 1989, while the management was seriously thinking of further development to increase production, reduce wastage, cut down energy costs, the Ministry of Industries kindly selected Rolmil Kenya Limited as a model plant and recommended the company to UNIDO and the Commonwealth Secretariat.

UNIDO consultants visited Rolmil, and had long discussions with the senior management and technical staff. The outcome of these discussions led the management to further invest in Phase II of development and successfully commissioned the following equipment items in February 1990.

(a) A HIGHER CAPACITY MILL GEAR BOX

A separate reduction and pinion gear boxes was installed to start with; to drive the 7 stands to twin drives as to accelerate speed of rolling in 5th, 6th and 7th drives to increase production. A new 800 HP motor was purchased by Rolmil for this purpose. The second drive is expected to be commissioned by the end of September 1991.

With the new bigger size gear box, the mill is already rolling full length of universal size (3" x 4" x 54") ingots successfully.

(b) IN ORDER TO SAVE ENERGY

New thin film burners were fitted in the reheating furnace. A new recuperator was installed to preheat the incoming air supply to the burners by utilizing the waste heat from the outgoing flue gases. This new system has saved about 28 % fuel oil from 1990 onwards (figures given separately).

(c) ON MELTING SIDE

To increase the production and reduce downtime, a new 10/5 ton capacity overhead crane was installed in January 1991. This has considerably reduced the operational time losses and tap-to-tap period has reduced from 3°-45' to 3°-15' and in some cases to 3 hours.

(d) BAILING PRESS

A bailing press for processing light scrap and oxygen lancing system was also installed in December 1990.

(e) OTHERS

To facilitate rolling of higher sections the whole pattern of pitside casting was changed. Mould size from 2.5" x 3.5" x 48" was replaced by 3" x 4" x 54" size of ingots with the addition of new bottom plates.

Further improvement was made in the concept of rolling by training four persons from the mill, who were sent to India to get practical in-plant training in "looping" practice in early 1991. They underwent training for two weeks. A new shearing machine was fixed to but the finished lengths in March 1991. Since then, looping practice is being continued for lower sections. Repeaters will be installed in due course.

All the above exercises resulted in saving of energy, better yield, lower percentage of off-cuts, production of new sizes and above all - enhancement of skill and confidence in local staff.

UNIDO ASSISTANCE

UNIDO has provided the following equipment items as part of the rehabilitation programme

(a) TEMPERATURE MEASURING EQUIPMENT

The conventional method of temperature measurement was being practiced in the melting shop. The temperature measuring equipment was supplied and installed by UNIDO consultants in November 1990. Some important spares were also provided. Since then, the instrument is being utilized for measuring the liquid steel temperature.

(b) CARBON AND SULPHUR MEASURING INSTRUMENT

A carbon and sulphur measuring instrument was supplied and commissioned in December 1990 by UNIDO. This apparatus is being used but in an off. the instrument is giving erratic results. The company requested the UNIDO consultant Dr. Richter to assist in rectifying this malfunctioning.

(c) TOOLS AND WORK BENCHES

On the advice of UNIDO consultants, a new workshop building was constructed by Rolmil Kenya Limited. A number of tools and work benches were provided by UNIDO.

(d) LECTURES AND PRACTICAL TRAINING

UNIDO consultants were also present from September to December 1990 in different periods and gave advice on melting practice and maintenance.

A series of lectures and practical demonstrations were given by Mr. Edwin Csank on "foamy slag process" in melting. This is being practiced in the melting shop to the best of the company's capabilities under the existing local conditions.

On the maintenance side, Dr. Rudolf Richter and Mr. Erich Troger advised the maintenance department on equipment, crane gear boxes, and also gave their expert advice on selection of equipment, fabrication of new crane, etc.

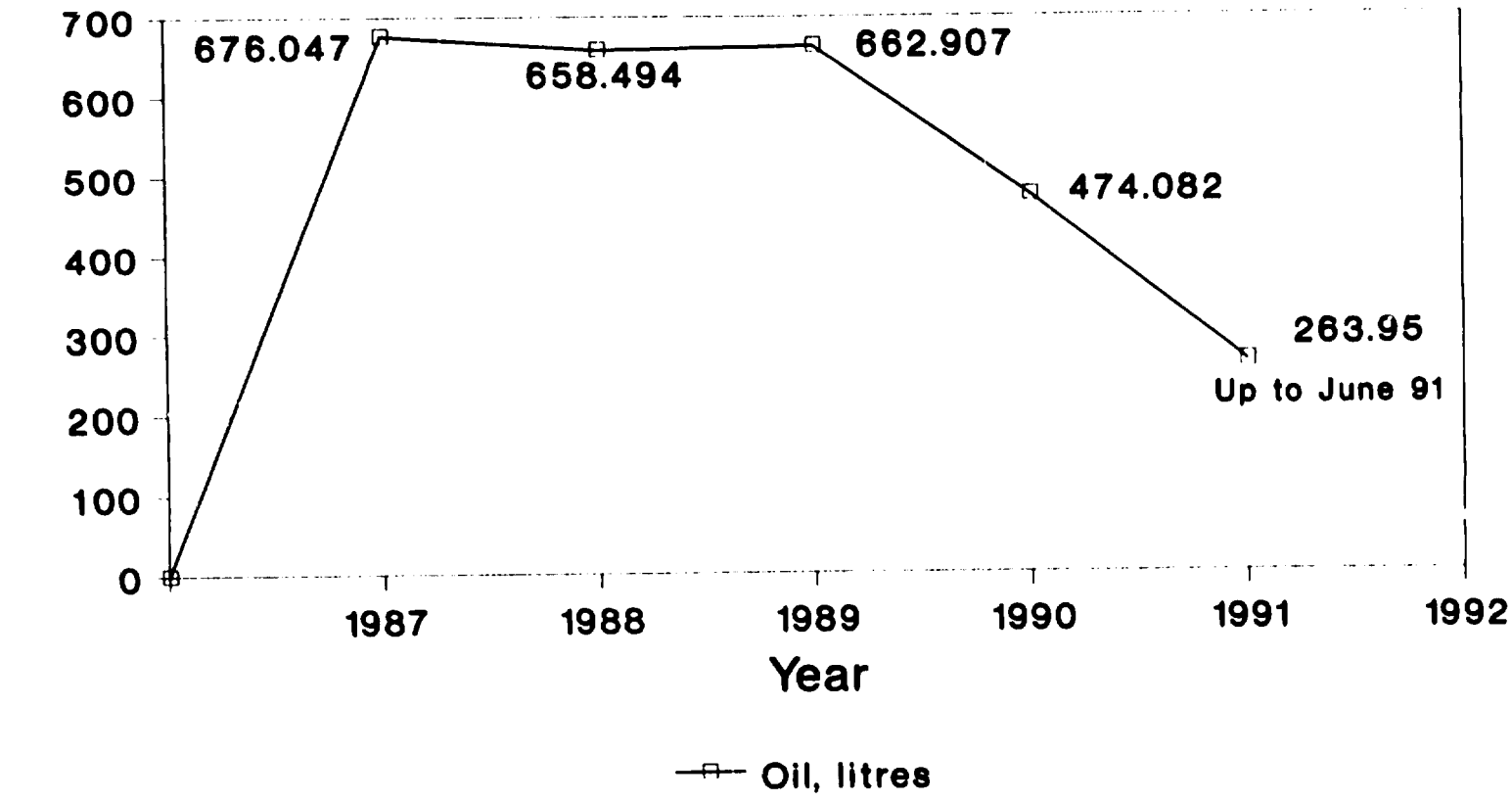
With the addition of scrap bailing, oxygen lancing system, foamy slag process, there has been an increase in steel production from 10 to '5 %. This could be further improved if the number of scrap charges are reduced.

Most of the scrap locally available is in the form of scrapped automobiles and from food processing industries. Processed scrap is not available. Rolmil Kenya Limited has to process the scrap on their own, which requires cutting, shearing, bailing, etc., Scrap from food processing and canning industries are coated with tin which is harmful to steel. Scrap has to be chosen very carefully, which is being done at Rolmil.

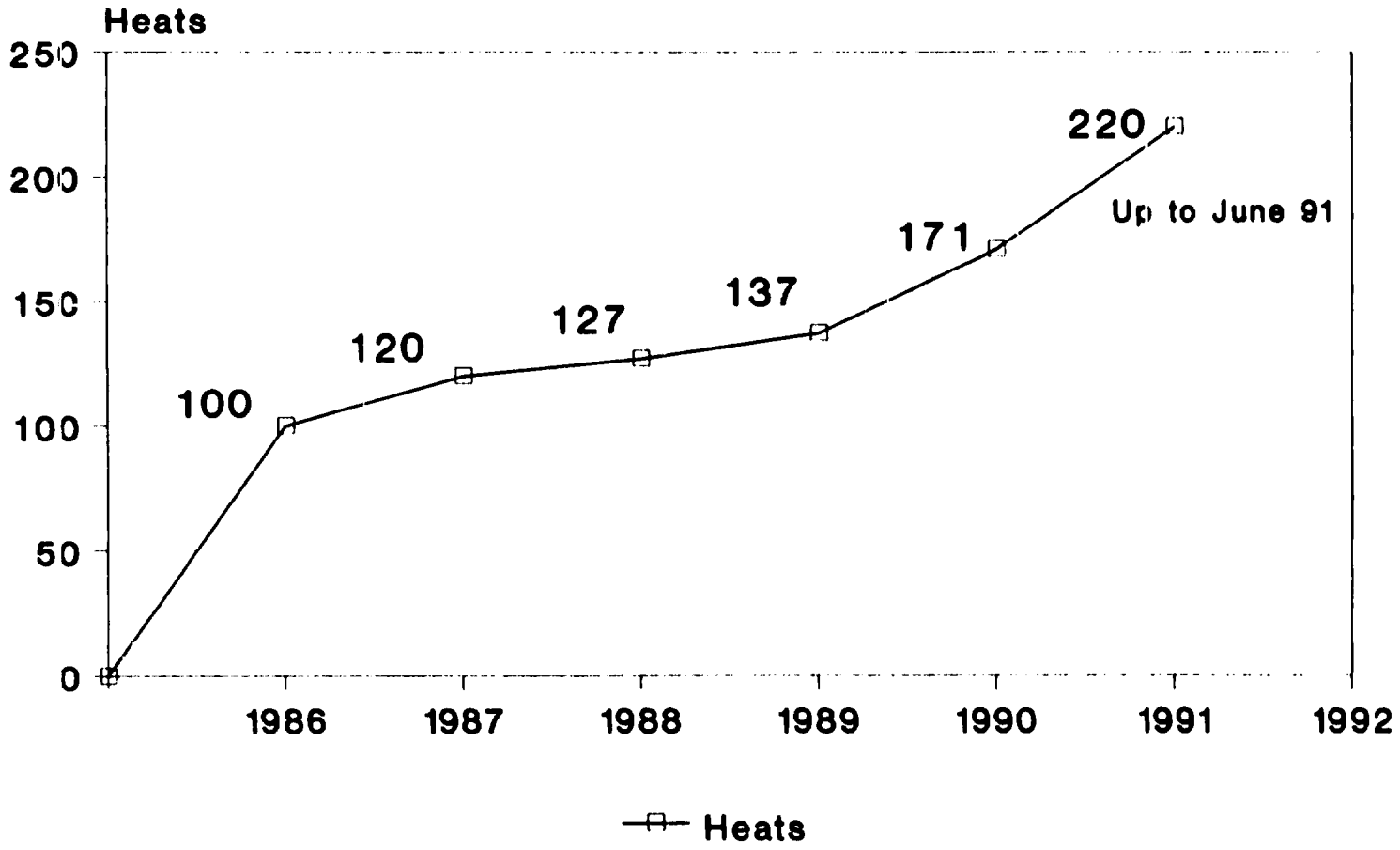
In most developing countries, scrap melting and refining is done in electric arc furnaces unlike in the developed countries where electric furnaces are utilized mainly for melting scrap and refining (secondary metallurgy) is done in ladle arc furnaces. This saves considerable time and more melts could be taken in the electric furnace.

In conclusion, steel production would improve if scrap processing units are set up, shredded scrap is mace available at a subsidized rate, and if more local personnel are sent to long time training programmes in developed and modern steel plants abroad.

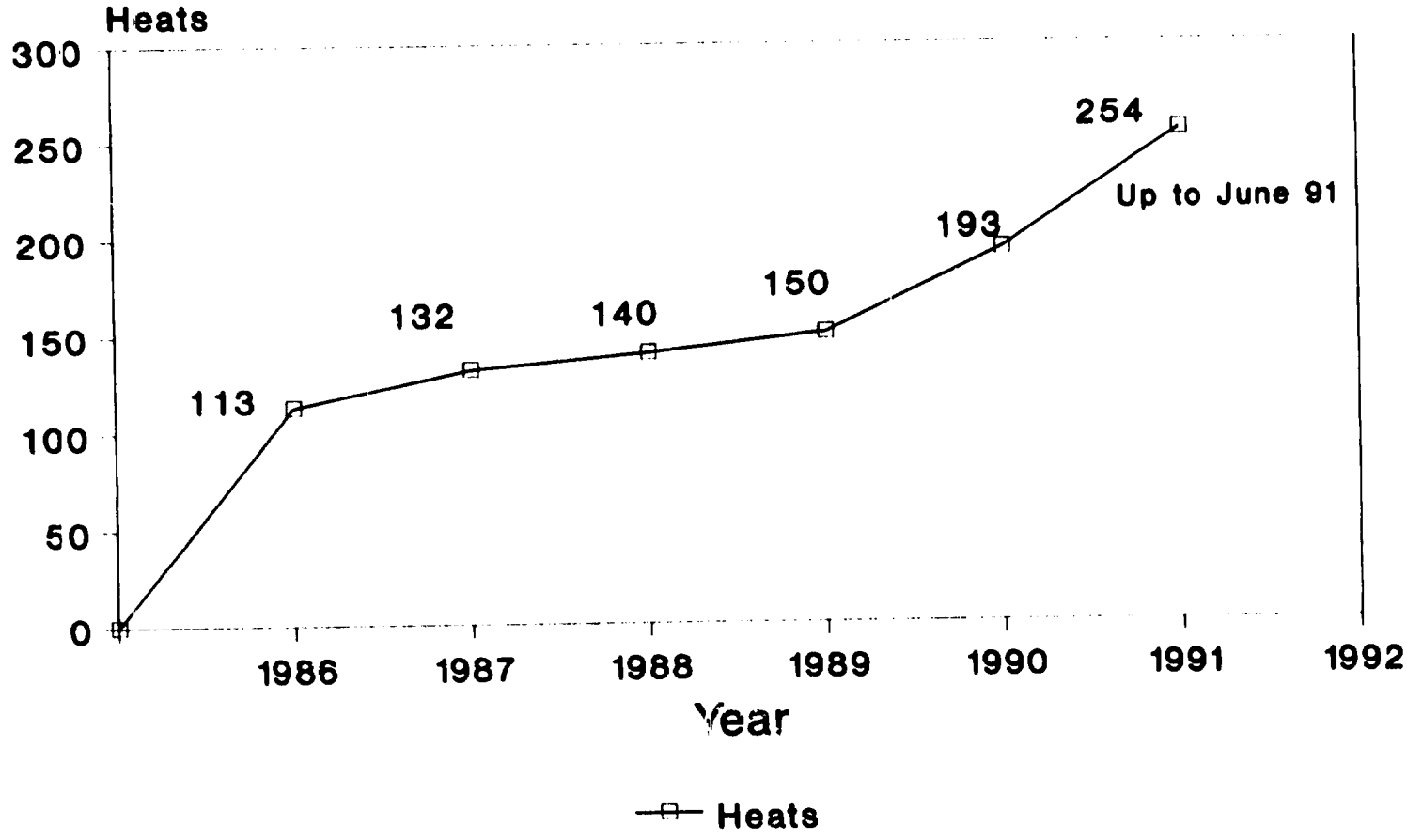
MILL OIL CONSUMPTION
IN LITRES



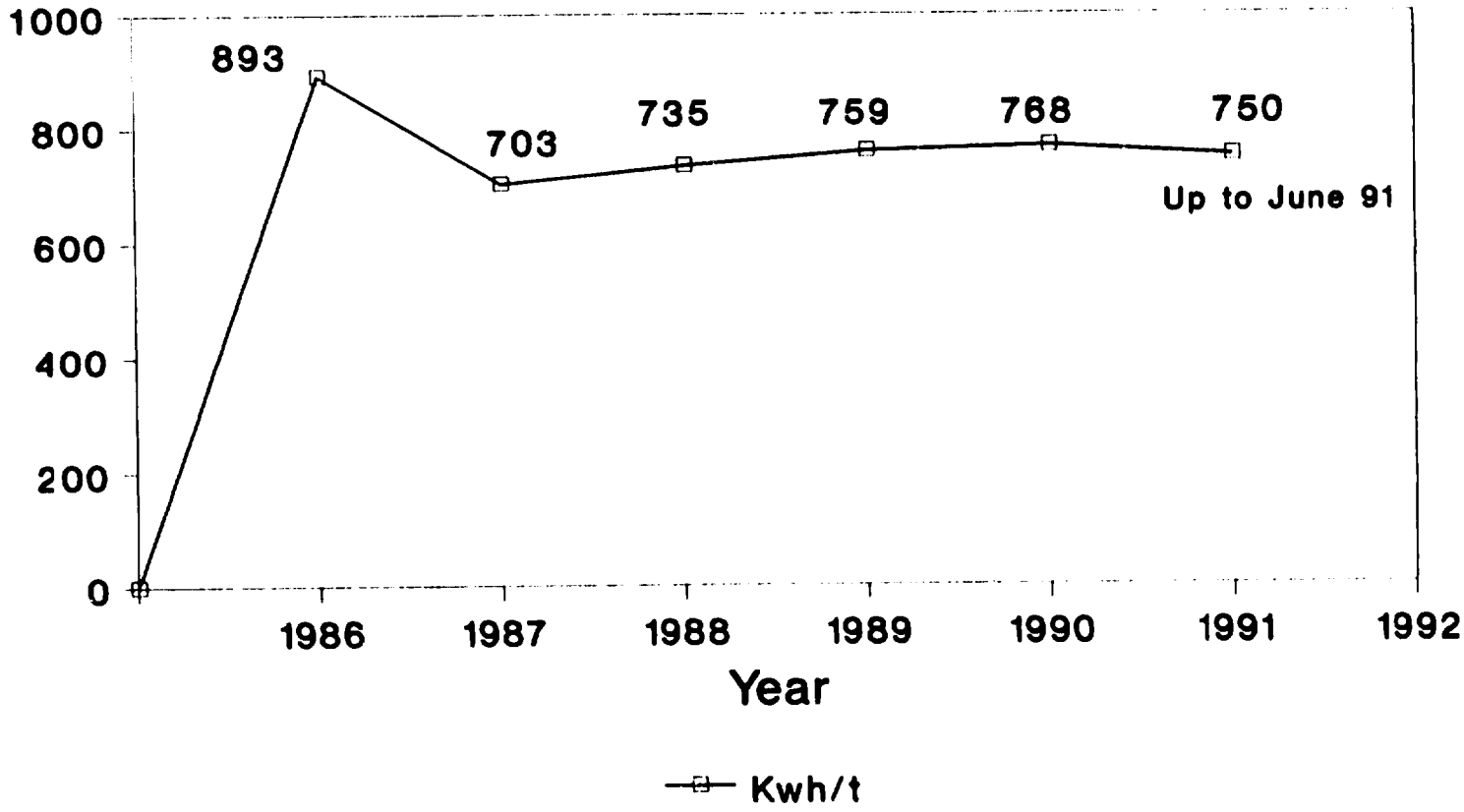
FURNACE LINING LIFE



FCR ROOF LIFE



KWH/TON POWER CONSUMPTION
IN MELTING DEPARTMENT



REPORT ON KENYA UNITED STEEL COMPANY LTD

by

Mr. U.K. Gosh, General Manager, Development

1. COMPANY BACKGROUND

Kenya United Steel Company Ltd. (KUSCO) was formed in June 1969 in partnership between the Development Finance Company of Kenya (DFCK) and East African Wire Industries Ltd. (EAWIL). But KUSCO's story started 20 hears before that date in 1949 when EAWIL established the first nail making unit in Kenya.

In 1970 KUSCO commissioned the first rolling mill in the country and thereafter set up a 5 ton arc furnace in 1975 and a second furnace in 1982. During this period, KUSCO also added other machinery such as bright bar drawing, cold twisting, wire drawing, wire galvanizing and allied wire products manufacturing facilities.

KUSCO now annually processes around 65,000 - 70,000 tons of steel based products.

2. PRODUCT RANGE

KUSCO's present product range includes reinforcement steel rods and bars in both normal and high tensile (cold twisted square) and in nominal sizes ranging 6 to 40 mm; EN8/EN9 quality hot rolled round bars; bright shafting bars in mild steel and EN8/EN9 quality bars and large sized flat bars.

It also produces varieties of wire products such as nails, barbed wire, chain-link fencing, rivets, welded mesh, reinforcement fabric, annealed wire, etc.

3. MANUFACTURING PROCESS AND QUALITY CONTROL

KUSCO's manufacturing process includes making steel in electric arc furnace from scrap, casting the same into pencil ingot through bottom pouring, hot rolling pencil ingots into round and square bars, cold twisting square bars to obtain high yield grade reinforcement bars and rods, drawing bright shafting bars and straightening and cutting coils in straight lengths.

KUSCO operates at a fairly high level of technology with modern plant and equipment operated by adequately technically qualified personnel. Its machinery is well maintained through judicial and skilful preventive as well as break-down maintenance with the help of its excellent in house workshop facilities.

A fully equipped and mechanical quality control laboratory supported by tight in-process quality controls at every stage of operation enables KUSCO to maintain cast-wise identity of its rolled products, produce bars and rods complying with relevant standards and provide own test certificates to customers.

4. PAST PERFORMANCE AND FUTURE OBJECTIVES

KUSCO has been performing reasonably well in the past and producing around 20,000 tons of rolled stock per annum from its own crude steel.

It is now the intention of KUSCO management to increase the present production level to 60,000 - 70,000 tons per annum, enlarge its product based and penetrate more into the export market.

5. REHABILITATION PLAN

As a step towards achieving the above objective, KUSCO has drawn up short-term and long-term rehabilitation plans and already initiated action.

The Short-term plan mostly centers around eliminating operational inadequacies and further increasing its competitiveness in the market, particularly in the export market. The visit of experts carrying out UNIDO sponsored projects under reference DP/RAF/88/072, to KUSCO, particularly three equipment items provided by UNIDO as part of this project has been of great help in this matter. However, some of the operational problems identified by the visiting team are already known to KUSCO's management and technical team but remain unsolved due to several constraints.

Nevertheless, subsequent to the visit of the project team, KUSCO has started ladle preheating resulting in all round encouraging improvements including a decrease in the tapping temperature and it is now envisaged to implement the following:

- Improvement in scrap processing through introduction of faster thermic lancing (already implemented) and purchase of pre-compaction shearing machine
- Repair of existing spectrometer
- Reduction of further electricity consumption
- Incorporation of cooling tower in rolling mill water circulation system to enhance fibre bearing life
- Introduction of high tensile (natural) hot rolled deformed bars.

While some of the above objectives can be accomplished by KUSCO with its own managerial and technical expertise, it needs assistance from PTA in conjunction with UNIDO or similar other institutional bodies in convincing the competent authority in Kenya for a more favourable electricity tariff for the steel industry and on-the-job training of its staff in steelmaking and rolling of high tensile (natural) hot rolled deformed bars.

KUSCO's long term rehabilitation plan includes
- Installation of continuous casting machine which is already at site
- Incorporation of a bigger arc furnace
- Modification of the rolling mill by revamping the existing reheating furnace and incorporating a bigger rougher at stand No. 1 to facilitate rolling larger sized billets
- Installation of down-stream facilities to enable rolling of 5.5/8.0 mm

drawable quality wire rods in coil weight of 150/200 kgs

The proposed rehabilitation plan is intended to be undertaken in two phases. It will enable KUSCO to meet the increased rolled stock production requirements for the local and export markets, cater to its captive needs of wire rods, supply the right quality billets to other re-rollers in the PTA region and, if need be, meet the wire rod requirement of other wire drawers within the region.

Preliminary discussion with equipment suppliers, including the original manufacturer of the rolling mill have already been undertaken. However, successful implementation of the above rehabilitation plant requires solution of certain technical complexities including immediate erection and commissioning the continuous casting machine which is beyond KUSCO's scope of competence. also it involves large financial investment. Hence, KUSCO seeks technical and financial assistance from PTA in conjunction with UNIDO or other international organizations.

6. CONCLUSION

With its adequate technical and managerial experience together with modern equipment, operating at a fairly high level of technology, KUSCO can form the nucleus for PTA's development efforts. Hence, if KUSCO gets adequate technical and financial assistance from PTA, it can successfully implement its rehabilitation plan and effectively supplement PTA's policy to provide a firm basis for the overall industrial and economic development of the region

Keeping in mind that depleting availability of scrap on the local market may be a hindrance in the future to KUSCO's efforts to increase the melting capacity, the Company has already looked into ways and means of accepting DR iron as a part of the charge and is willing to participate in any effort undertaken by PTA towards this direction.

ANNEX 7

Report on the status of the iron and steel industry in Angola

by

Mr. Kinlongo Kisakemwa
Maintenance Manager, Pipe Plan of Angola

The author briefly reviewed the equipment and machinery available in the country, the principle raw materials and the production capacity and product range. It was noted that

(a) Angola suffers from shortage of raw materials, high down-time due to frequent breakdown, lack of spare parts and insufficient number of skilled manpower;

(b) Action had been initiated to rehabilitate the old pipe rolling mill by identifying the area of failure and substituting clean pipe rectifier unit;

(c) It was planned to improve the cooling system by using distilled water in the future;.

(d) The store was being reorganized and redundant spares were to be removed;

(e) Training courses in electrical engineering and operations were being conducted to improve manpower capability and reduce downtime;

(f) The maintenance set up was being reorganized and strengthened for better performance.

STEEL PLANT REHABILITATION IN MAURITIUS

by

Mr. V. Gopauloo, Assistant Factory Engineer
Sections Rolling Ltd.

In Mauritius three steel rolling mills exist, all dealing with the re-rolling of billets, 60 x 60 mm x 6 meters long. The total net production comes to around 28,000 tons per year. At the sections rolling billets of 60 x 60 x 6 m are re-rolled into bars of sizes 10, 12, 16, 20 and 25 mm rod for the reinforcement of concrete. The net production if 8,500 tons per year.

The layout of the Section Rolling Ltd. is shown in the Annex. The plant has a yield of about 28 tons/9 hr shift of small sections such as 10 and 12 mm as an average and 33 tons of other sizes. The furnace oil consumption is around 68 litres/ton with electricity being 72 units/ton. The cost of production per ton works out to be approximately US$ 464.

Recently a new reheating furnace has been installed. It has a capacity of 8 tons/hour, which is higher than the older one. The speed of the mill has been increased from 220 rpm to 255 rpm. The above modifications enabled an increase in production of up to 33 tons for small sizes and up to 45 tons for bigger sizes.

The size of the reheating furnace has helped in making the maximum utilization by having longer billet pieces in the furnace.

As 60 x 60 mm x 6 m is more expensive than billets of bigger size it will be more beneficial to go for re-rolling of 100 mm^2 billets or even of bigger sizes. This would definitely increase the production and be less costly owing to cheaper cost of raw materials and practically the same energy consumption. To cater for the above I have proposed a set up as shown in Annex 2 which has already been accepted by the management. Additional equipment items have been included in the layout.

This would enable the plant to roll 100 mm^2 billets. A 2 stand roughing mill (12 inch high) has already been installed. It is driven by a 720 HP motor at 160 rpm. An additional two finishing stands are to be installed which would be run by a 420 KW motor at 310 rpm. If it is decided to roll for longer hours or even in a second shift, the production would be even better, with lots of savings in almost every department.

This increase in production would not only curb down the imports of finished parts for the local market but would also help Mauritius in entering the export market to the surrounding islands.

DESBRO INTERNATIONAL

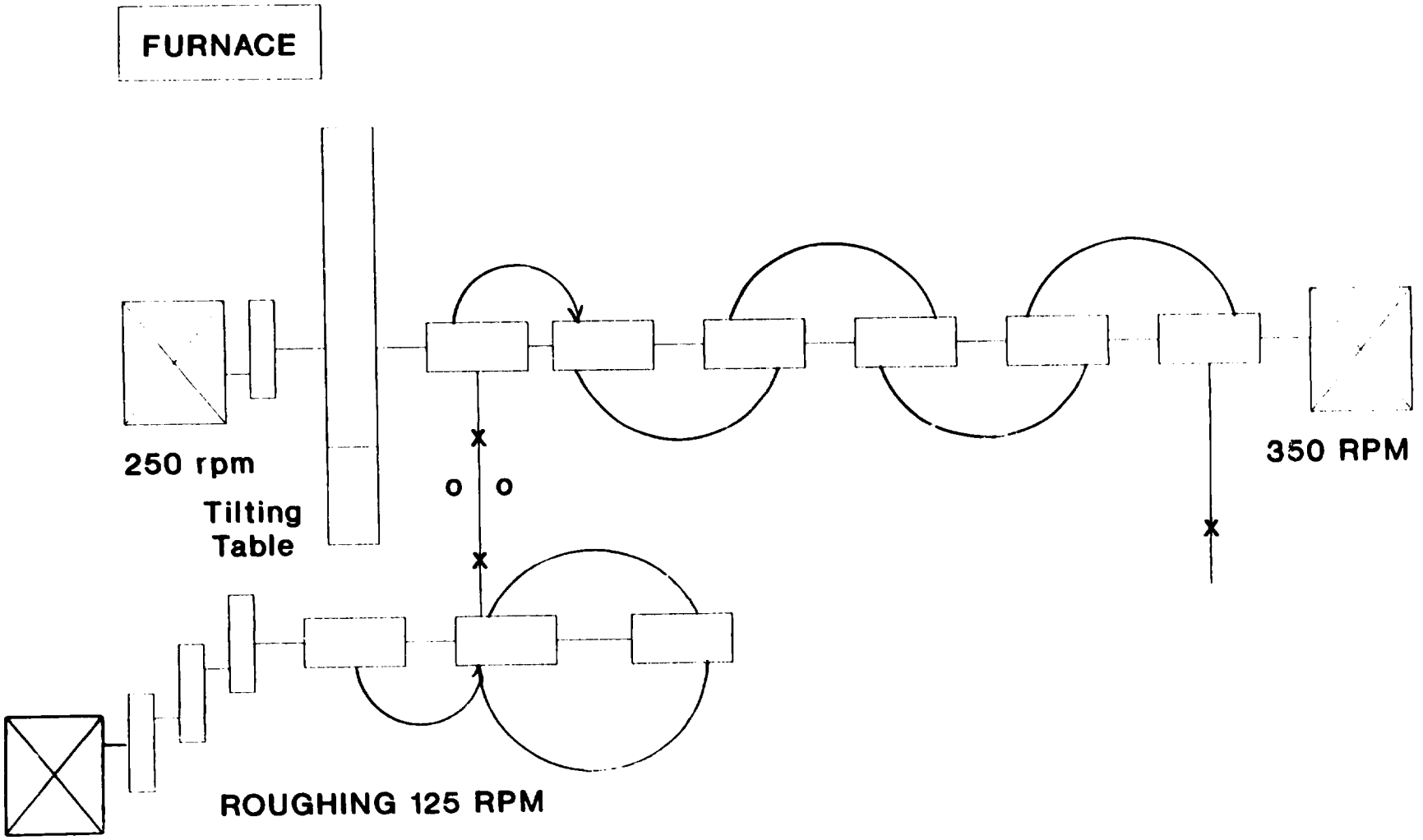
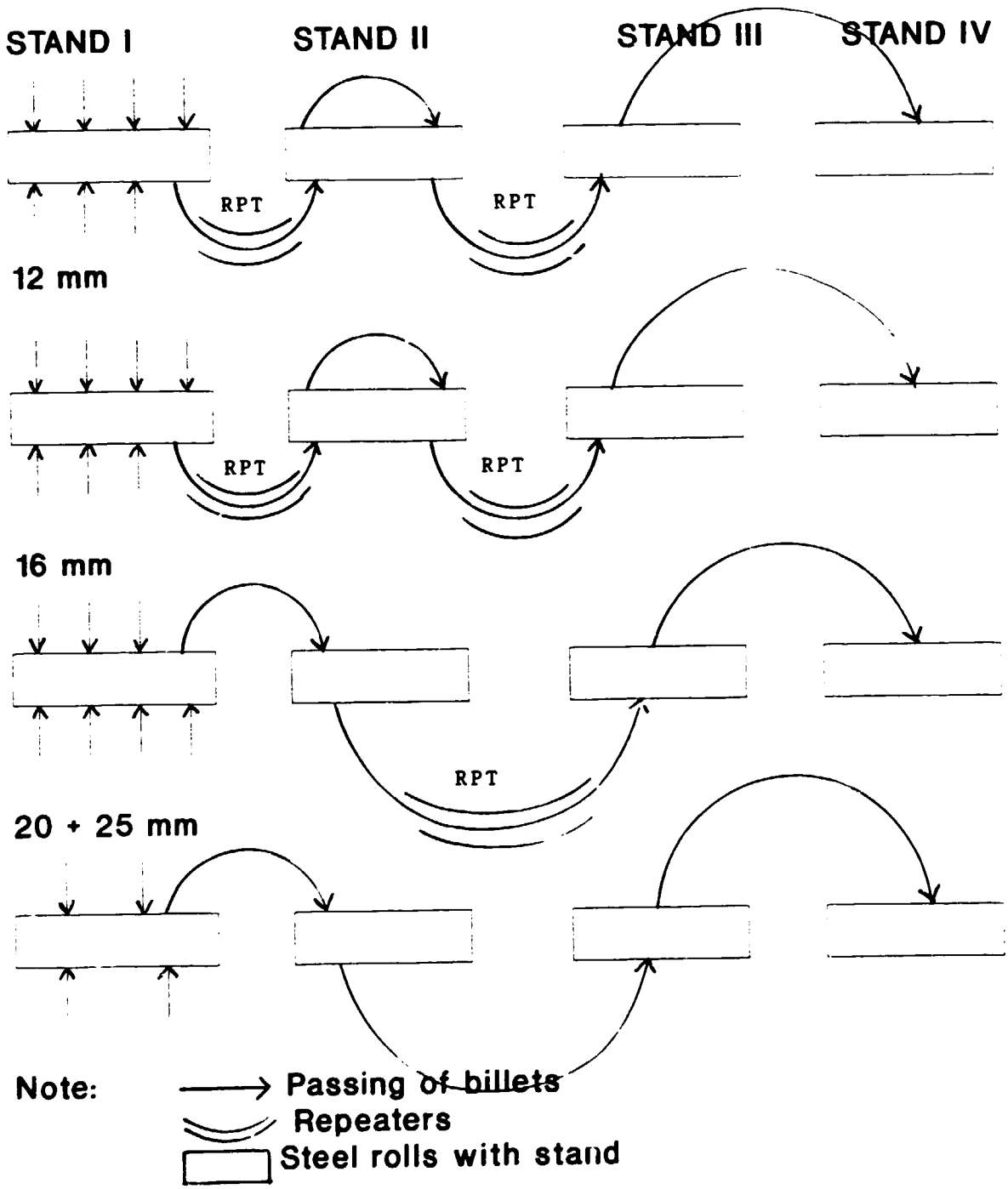
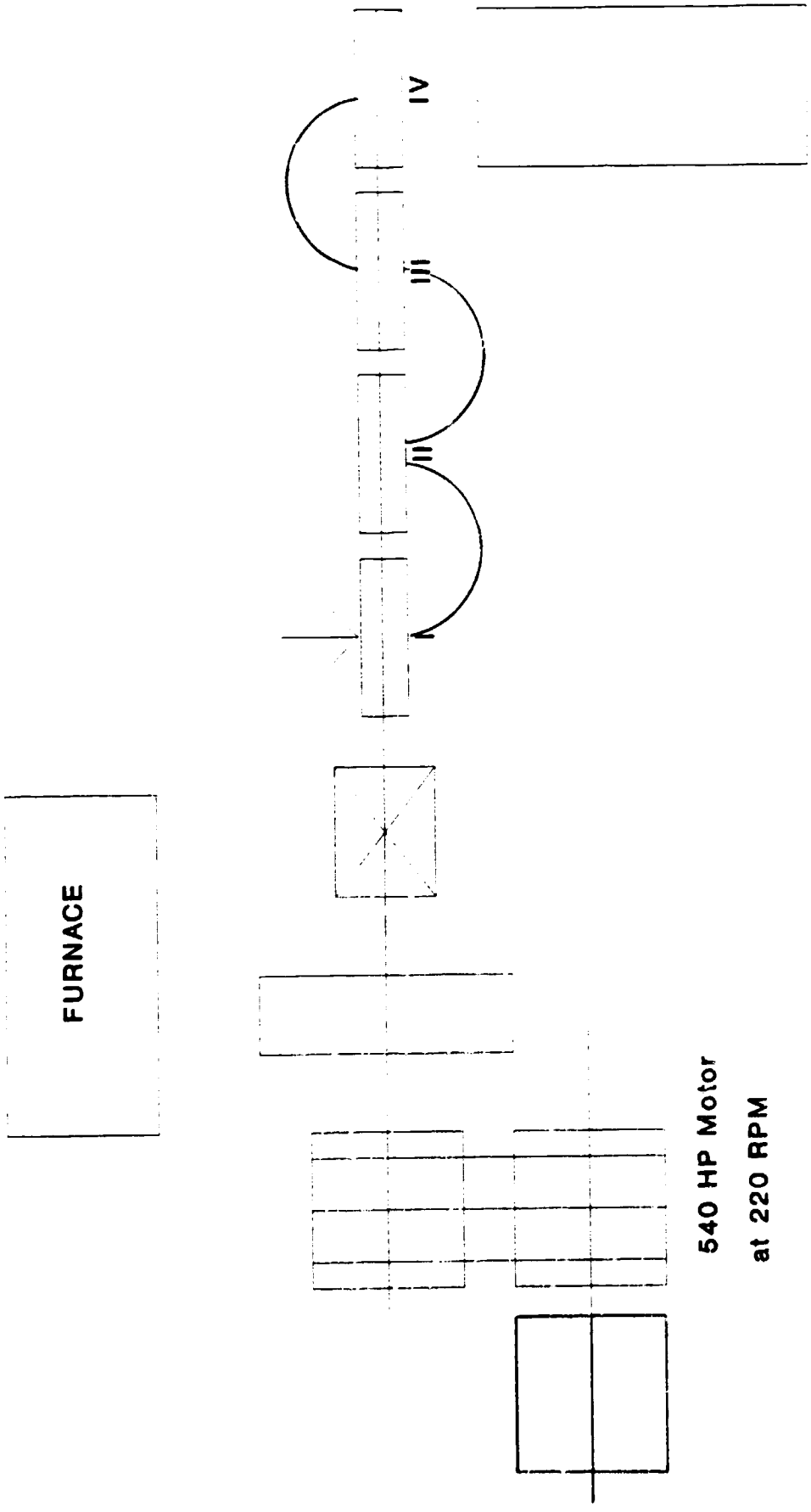
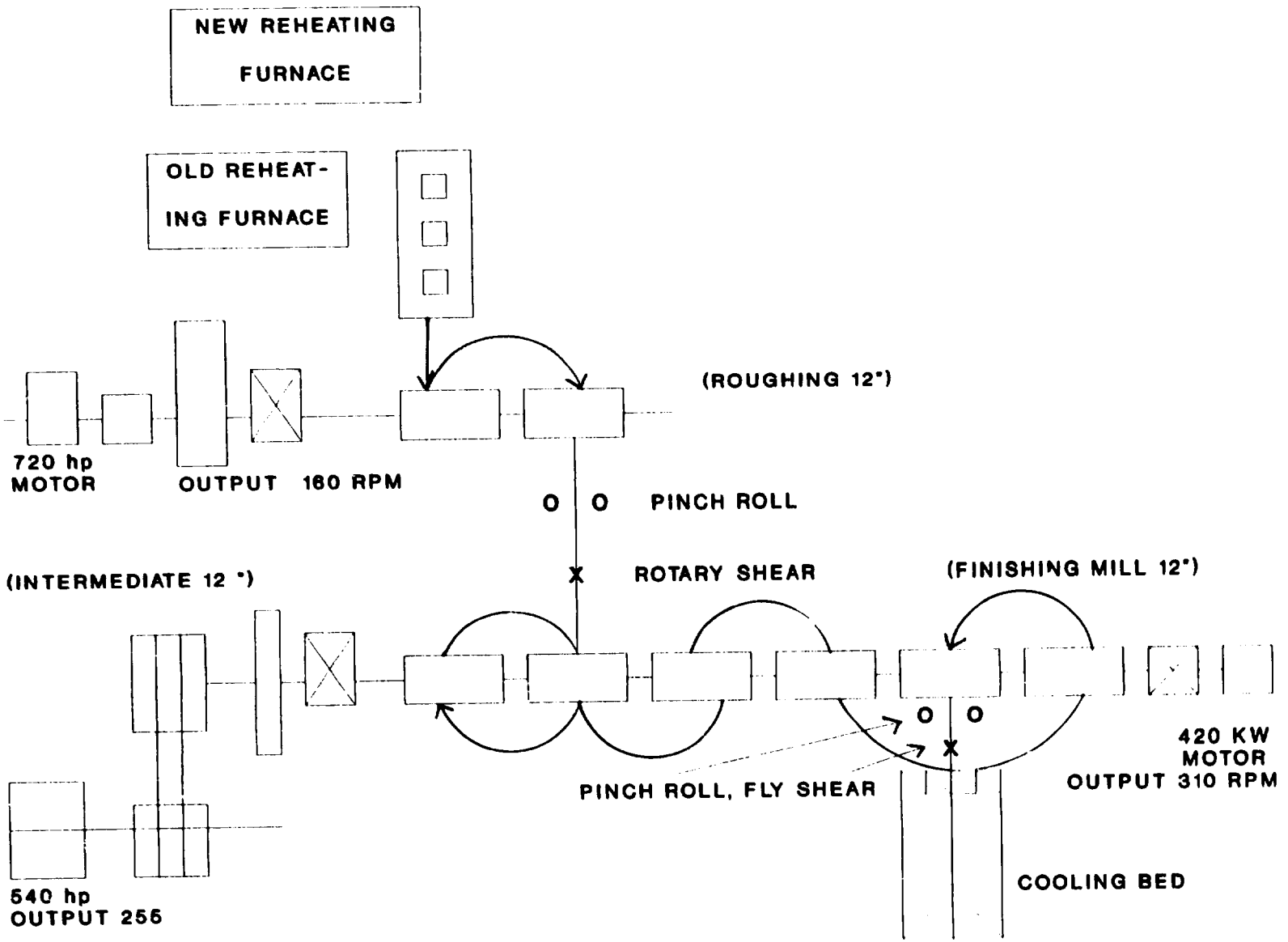


Figure 1


10 mm
STAND I
STAND II
STAND III
STAND IV
RPT
RPT
12 mm
RPT
RPT
16 mm
RPT
20 + 25 mm
Note:
Passing of billets
Repeaters
Steel rolls with stand

DESBRO INTERNATIONAL - ANNEX 1




NEW REHEATING FURNACE
OLD REHEAT-ING FURNACE
(ROUGHING 12")
720 hp MOTOR
OUTPUT 160 RPM
PINCH ROLL
(INTERMEDIATE 12 ")
ROTARY SHEAR
(FINISHING MILL 12")
420 KW MOTOR OUTPUT 310 RPM
PINCH ROLL, FLY SHEAR
COOLING BED
540 hp OUTPUT 255

ANNEX 9

Report on Companhia Siderurgica de Moçambique (Ltd.) - ex CIFEL

by

T.M. Senzani-Chicogo,
Director General of Metallurgy,
Ministry of Industry and Energy

1. BACKGROUND

The metallurgical sector of Mozambique consists of foundries, rolling mills and wire drawing of ferrous and non-ferrous metals. For this reason the sector is divided into two sub-sectors

- Basic industries producing iron and steel
- Basic industries producing non-ferrous metals

In the former sub-sector, the main enterprise of significance in the modern metallurgical sense is Empresa de Siderurgica de Mocambique (Ltd.) - ESM which was formed in May 1991 on the basis of partnership between E.M.M. Mocambican Enterprise (Private) - 60 % of the shares) and the Government of Mozambique (40% of the shares). However, CSM is a new company built on the basis of Companhia de Industria de Fundição e Laminagem (CIFEL) which was founded in 1955 and operated up to 1991 when it was would up and replaced by the new venture CSM. Therefore CSM is ex-CIFEL.

The nucleus of CIFEL's production facilities comprises

1. Foundry shop
2. Bar and rolling mill
3. Wire drawing shop
4. Mechanical workshops

The foundry shop has two casting facilities

(a) two cupolas installed in 1955 with a capacity of 1,500 tons/year

(b) Electric arc furnace supplied by RSA and installed in 1963 with a capacity of 500 tons/year

In 1987 these facilities were able to produce a total of 4,000 tpy. The bar and rod mill was supplied by Danieli of Italy, installed in 1958-1971 with 40,000 tpy capacity. Its product range are:

- round bars 10 - 15 mm diameter
- wire bars 6 - 8 mm diameter

The feedstocks are mainly billets imported from Zimbabwe and RSA in the following sizes: 80 x 80 mm^2 and 100 x 100 mm^2.

The following is the data for bar major production (tons per year):

Bar mill	1985-86	1987	1988	1989	1990
	1338 816	5068	2799	2469	1899

The wire drawing mill was installed in 1960 by "Mill" Eslan and has a 3000 tpy capacity. It registered the following production in the period 1988 - 1989

Wire rid mill	1985	1986	1987	1988	1989	1990
Wire coils of	1351	924	2855	2313	1437	1000

As already alluded to earlier, the imports from Zimbabwe were 8000 tons in 1989 and 6000 tons in 1990.

The number of employees were as follows:

Office	141
Shop	459
Others	214
	Total: 814

From this total the skill composition is as follows:

	CIFEL	CSM
Engineers	1	5
Technicians	49	55
Workers	703	600
Skilled	216	310
Unskilled	187	400

2. BASIC PROBLEMS

When the Government of Mozambique intervened CIFEL was an abandoned enterprise based on the philosophy of import substitution. The tenet of this philosophy can be characterized by the following stages:

(i) Operational apprenticeship stage. The main objective of this phase was obtaining knowledge of operational technologies and production control management

(ii) Technological absorption and development stage.

This stage for its function requires the organization of operational groups which ought to have been established at stage (i), and of technical teams. These two groups were supposed to be required in the process of introducing modifications and improvements in metallurgical technologies, during the overhauling and maintenance of existing units.

In principle the above philosophy met tremendous difficulties and has only been implemented to stage (i) above. The declining trend in production described above proves this fact. For instance, it is easy to see that more than a half of the total workforce is composed of unskilled workers. Graduate engineers have

significant statistical presence.

The declining trends in production and the shortage of skilled workers are due to many factors beyond the control of the plant management and the Government of Mozambique. Amongst them the following are important:

The on-going destabilization due to war has brought into virtual paralysis production in the most important sectors that comprise the clients for CIFEL's products, e.g. sugar industries, tea industries, cement and others.

Besides, the exporting sectors were unable to meet external markets requirements which resulted in limited foreign exchange earnings. Therefore, there was no foreign exchange for acquiring the necessary spare parts and machinery for rehabilitation programmes.

Basic Maintenance projects

From the available data and information the average age of CIFEL's machinery and equipment is more or less 25 years which implies that they are technically not up-to-date.

The organization of maintenance and servicing is centralized with three department chiefs: foundry, rolling mills, annealing and mechanical.

The organization is faced with the shortages and poor availability of the essential groups of tools and measuring instruments.

Other Problems

Shortage of raw materials and irregularities of power supply.

Rehabilitation and Expansion

Companhia Siderurgica de Mocambique is in the process of reconsidering the basis philosophy which was adopted by the Government of Mozambique by redefining state (i) as including:

- Revamping of the existing wire and bar mill;
- Erection of mini steel shop with continuous caster;
- Revamping and modernization of foundry and mechanical workshops;
- Installation of new drawing machines;
- Installation of an induction furnace and establishment of a training centre.

REHABILITATION PROGRAMME - STEELCAST PLANT DAR-ES-SALAAM, TANZANIA (A DIVISION OF ALUMINIUM AFRICA LTD.)

by

Mr. Sovello A.A. Mgani
Deputy Works Manager, Steelcast (ALAF)

I. GENERAL INFORMATION

Introduction

The Steelcast plant was erected in 1976 and commissioned in March 1977. The plant has two production units, namely a 12 ton capacity electric arc furnace (transformer rating 5 MVA) and a twin strand continuous casting machine. The main products of the plant are mild and high tensile steels.

Successful attempts have been made to cast other types of steels, e.g. low carbon steels used for wire rod and nails manufacture.

The continuous casting machine (conticaster) is designed to turn liquid steel into billets of 80 x 80 mm^2, 100 x 100 mm^2 and 120 x 120 mm^2. So far only 80 x 80 mm^2 and 100 x 100 mm^2 have been produced.

The plant has an installed capacity of 18,000 tpy (1,500 tons per month) based on a three-shift operation.

Present Capacity Utilization

Due to ageing of machinery and equipment, plant downtime has always remained on the higher side for a long time. This has affected productivity and on average plant performance has remained at around 60 % over the last three years. Downtime analysis for the plant shows that four to five times higher than the allowed time for breakdown is recorded every month, meaning that the plant availability is on the lower side.

II. PROPOSED REHABILITATION PROGRAMME

It has been proposed that the rehabilitation project will be carried out in two phases whereby the first phase will involve rehabilitation of existing machinery and equipment for better performance of the same and the second phase will involve installation of new equipment to boost up production by an expected 150 %.

Under phase one, much of the rehabilitation spares, equipment and machinery is expected to be acquired from the original plant suppliers, i.e. General Electric Co. of India and I.S.P.L. of India Co.

PHASE I

Main Shopfloor

(a) The Electric Arc Furnace: (Supplier G.E.C. of India)

- Bustubes - one complete set
- Copper inserts (Electrode diameter 300 mm)
- Winch units complete with spur reduction gears and D.C. motors
- 2 new hydraulic cylinders for furnace tilting
- 12 water cooled cables
- 2 roof lifting cylinders
- 2 roof lifting chairs

(b) The Furnace Transformer
- New OCB and spares or ACB with spares
- Tap changer (complete unit)
- 2 Transformer oil pumps
- Replacement of amplidyne with modern units of thristor converters

(c) Ladle and Tundish Burner Units
- Blowers
- Oil pumps

(d) Hydraulic Power Pack

(e) Furnace Pneumatics
(compressor, fittings delivery lines and accessories, etc.)

Pump House and Water Treatment Plant
- Water reservoirs
- Efficient pumps
- Delivery pipings, fittings and flow meters
- Acquisition of a new water treatment plant
- Improvement of cooling towers performance

The Continuous Casting Machine (I.S.P.L. of India)

- New dummy bar assemblies
- Replacement of spray aprons for both strands
- Complete units for oscillation assembly, i.e. motors, gear boxes, couplings, cams, followers top rollers, friction plates
- Spray pipes, 3 complete sets for both strands (one as spare)
- The pinch roll assembly requires drive rollers (4), couplings, heavy duty springs, pinch roll pressure gauges (indicators), etc.
- D.C. motors (complete with tachogenerators for casting speed indication at the platform and withdrawal section
- Spares for thyristor converters (electrical control panels)
- Spares for roller tables and skid bank, e.g. bevel gears, drive shafts, plummer blocks with bearings, etc.
- Billet casting machine workshop with all necessary machine tools for

fast and efficient maintenance

Improvement of scrap yard equipment
- Necessity of a big bailing machine or big crusher for bulky, light scraps, e.g. car bodies.

- Motorization of the charging baskets trolley which is presently rolled on rails manually

- Acquisition of heavy duty forklift

PHASE II

Under Phase II of the project, the following new machinery and equipment are expected to be installed in order to boost production upwards to 150 %.

New Conticaster (Supplier: Danieli of Italy)
- Provision of mechanical and electrical equipment and related components for the casting machine (40,000 tpy)
- Laying of pipings, fittings and flowmeter controls for fluids
- Instrumentation and automation of the continuous casting process
- Provision and commissioning of all spares and consumables for the unit
- Provision of erection materials other than the above
- To provide a workshop for the casting machine personnel, well equipped with necessary tools

Installation of New Electric Arc Furnace (Supplier: Danieli of Italy)

The new furnace to be acquired and installed shall have the following general parameters:

- Capacity:	15 tons of liquid steel
- Transformer rating:	6000/7000 KVA
- Supply network	3 Phase, 11 KV, 50 Hz
- Auxiliary voltage	400/440, 3 Phase, 50 Hz

Ladle Furnace (Supplier: Danieli of Italy)

This unit is very important for modern steel making technology and continuous casting of high quality steels.

General requirements:

- Capacity	15 tons of liquid steel
- Power rating	6 - 8 MVA

Oxygen Plant

The present inconsistent trend of gas deliveries to the steel works by Tanzania Oxygen Limited, dictates the necessity to have an own oxygen plant within the factory premises.

Steady availability of oxygen and acetylene will enhance sustained continuity of plant works which will finally be reflected in better production performance.

Liquid Steel Handling Equipment

- Improvement of overhead cranes performance by providing all necessary spares for the Gantron cranes.
- Provision of tundishes for the new caster
- Provision of 15 ton capacity ladles

Manpower Training

To successfully achieve and sustain such an ambitious programme for a long time calls for appropriate training of the operatives, technicians, engineers and managers. This will ensure a strong, technically conversant workforce capable of running the rehabilitated plant to maximum productivity.

Study tours, familiarization programmes and management courses for key people may be included in the rehabilitation programme to run in parallel.

III. COMMENTS ON IMPACT OF THE REHABILITATION PROGRAMMES

As noted earlier, under Phase I of the rehabilitation programme, production is expected to improve up to the installed capacity of the existing plant which is 18,000 tpy. In the first place this will be achieved mainly by minimizing liquid steel losses arising from poor performance of machinery and equipment at present due to either age or defects.

Secondly, with all the above improvements on the plant machinery and equipment properly affected, downtime is expected to go down to nominal values and thus increasing the efficiency and availability of the plant for maximum production.

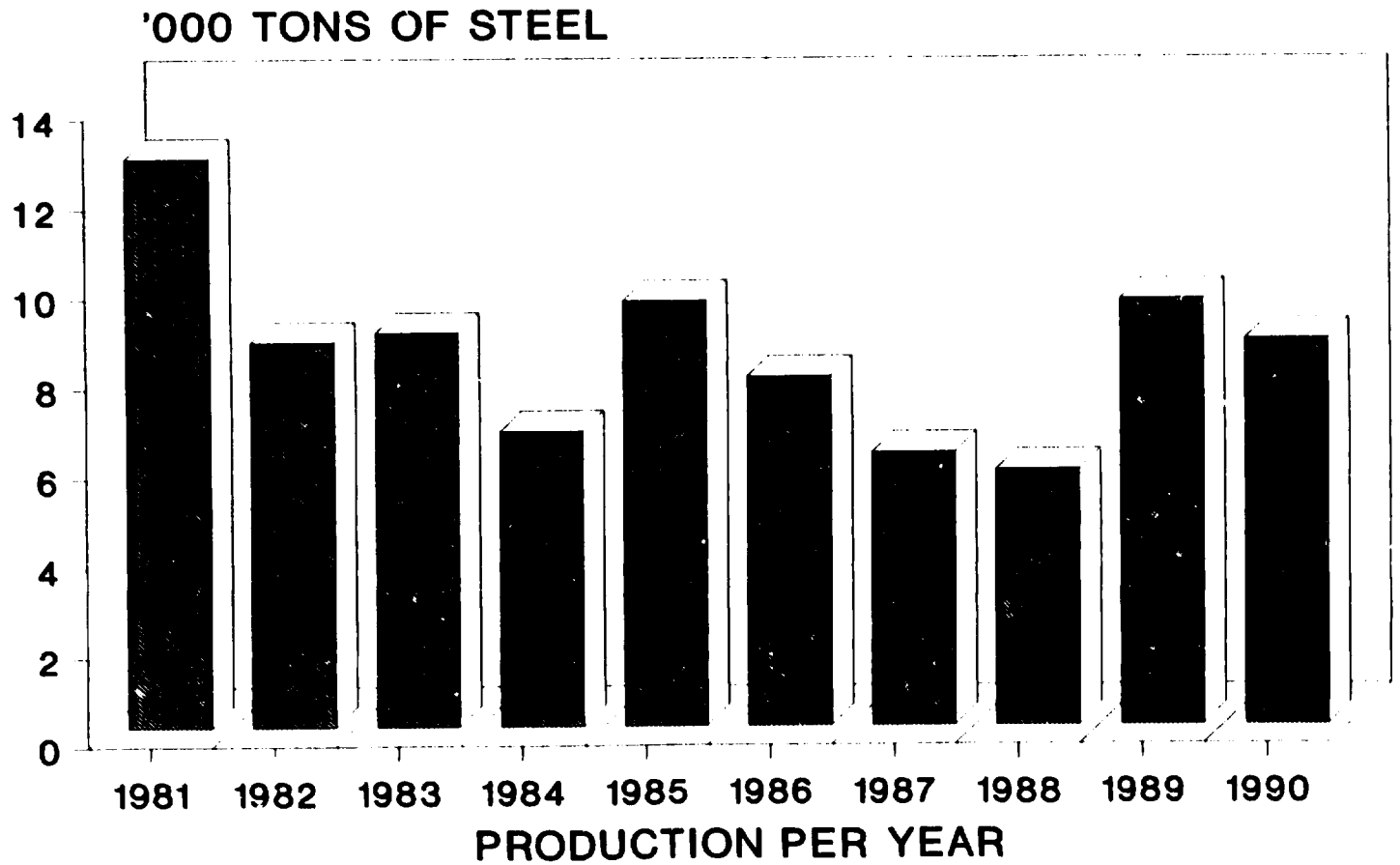
At the end of Phase II rehabilitation programme, Steelcast factory is expected to produce up to 120 tons per day by making five heats in the old furnace (10 tons capacity) and 5 heats in the new furnace (15 tons capacity). The quality of the steel will definitely improve, especially with the introduction of ladle metallurgy. The achievement of this programme will guarantee continuous feeds to the Tanga Rolling Mills. The Rolling Mills will be able to operate on a three-shift arrangement without having to import billets. This will save the nations foreign exchange reserves for other development priorities.

Annex II

EXPECTED COSTING FOR PHASE I REHABILITATION PROGRAMME

Unit/Machinery	Supplier	Value of rehabilitation
Furnace	G.E.C. , India	$ 300,000
Billet casting M/C	I.S.P.L., India	$ 300,000
Pump House		$ 100,000
Water treatment plant		$ 150,000
Ladle/Tundish preheaters		$ 50,000
Overhead cranes	Gantron	$ 345,000
Misc. equipment		$ 100,000

STEELCAST PLANT PERFORMANCE
1981 - 1990



REHABILITATION OF THE EAST AFRICAN STEEL CORPORATION LIMITED (UGANDA)

by
Dr. William Tsimwa Muhairwe, General Manager

Abstract

The brief report reviews the background of steel manufacturing at East African Steel corporation Limited in Uganda, from the early 1960ies and the circumstances that necessitated rehabilitation of the existing steel plant. A chronology of the rehabilitation effort is given and an up-to-date status of the rehabilitation programme. Areas of regional co-operation in the PTA region are also mentioned. The report is descriptive and is based on the experience of the author.

1. BACKGROUND TO EAST AFRICAN STEEL CORPORATION LTD. (EASCO)

EASCO Mini Steel Plant is located in the industrial city of Jinja on the northern shores of Lake Victoria, in the eastern part of Uganda (See Exhibit 1)

EASCO started operation in the early 1960ies. The main corporate object amongst many others was and still is to manufacture steel from ferrous scrap and convert the steel into plates, sheets, bars, angles, wires, bolts, nuts and any other articles that may be manufactured from steel. EASCO was the first steel plant of its size and kind in the whole of Est Africa and hence the name.

The initial technology for making steel at EASCO was to melt ferrous scrap in an electric arc furnace, refine the molten scrap to the desirable steel grade and cast the steel into ingots. These ingots feed the rolling mill through a reheating furnace. The products of the rolling mill feed the strip and wire drawing plant and the bolts and nuts plant.

The EASCO steel plant therefore comprises the following units:

(i) Scrap storage and processing yard

(ii) Melting shop with an electric arc furnace and casting facilities of a molten steel capacity of 25,000 tons per year (tpy)

(iii) Rolling mill with an ingot reheating furnace and a rolled steel capacity of 20,000 tpy of light/long sections.

(iv) Strip and wire drawing plant with a capacity of 500 tpy

(v) Bolts and nuts plant with a capacity of 250 tpy

(vi) Oxygen plant - capacity of 48,000 cylinders per year.

By 1989 the capacity utilization of the melting shop had reached 100 per

cent and just over 25,000 tons of molten steel were produced in that year. The plant was efficient and quite profitable. Expansion plans were in good progress.

Like all production units in Uganda, EASCO steel plant deteriorated in output during the disastrous regime of Idi Amin from 1971 to 1979.

In 1979, the steel plant could only produce 2,000 tons of molten steel in the whole of that year. a capacity utilization of about 8 % per annum. The plant was inefficient and unprofitable. Expansion plans were shelved. Rehabilitation and modernization were necessary to reverse the trend. It is the purpose of this report to focus on the rehabilitation activities which have been undertaken to restore EASCO steel plant to efficient and profitable operations as of the late 1960ies.

2. CHRONOLOGY OF THE REHABILITATION EFFORT AT EASCO

In early 1980, a study was undertaken by EASCO to determine the feasibility of rehabilitation and technical modernization of the EASCO steel plant. This study after independent appraisal was used to raise funds for the rehabilitation. By the end of 1982, the Government of Uganda had already secured a loan of US$ 12 .1 million from the Government of Italy to cover the cost of machinery, installation and commissioning.

A contract was therefore entered into between EASCO (the purchaser) and Danieli and C. S.p.A. of Italy (the seller) for supplying, erecting/installing and commissioning the new machinery and overhauling/repairing some of the existing machinery which would be retrained for post-rehabilitation operation. This contract excluded civil works which was to be carried out by EASCO in time for installation of the arriving machinery. The exclusion of civil works has caused delays as will be shown later on.

By 1985, the machinery had started coming from Danieli but the civil works had not been started due to lack of funds amongst other reasons. By December 1987, about 90 % of the machinery had arrived but there were yet no funds for civil works.

In April 1988, his Excellency President Yoweri Museveni of Uganda visited the steel plant and was shown the machinery lying about uninstalled due to lack of civil works. He promised that funds for civil works would be made available by the Government of Uganda considering the importance of steel to the national economy. In September 1988 the Government gave EASCO a go ahead to look for contractors to do the civil works. In December 1988 President Yoweri Museveni made another visit to the steel plant and found that tender documents for contracting civil works were under preparation. He repeated the Government commitment to see the project completed.

In April 1989, a contract was entered into between EASCO and Bazira Construction and Engineering Works Ltd., to do civil works in 47 weeks, this would beat the machinery suppliers' deadline for installing and commissioning the steel plant. The Contractor could not finish the civil works and EASCO had to look for another Contractor, Wade Adams Construction Ltd., who completed the civil works early June 1991 at a cost of approximately US$ 3.7 million to the

Uganda Government. This was too late. The machinery supplier demanded extra payment for installing and commissioning the steel plant. The obligatory period had expired and an insufficient sum of US$ 450,000 was the only money available to install and commission the steel plant.

3. PRESENT STATUS OF REHABILITATION

The present status of the project is that machinery is on site and that civil works have been done. Due to delays in the completion of civil works, extra funds will be needed to install the electric arc furnace, the continuous casting machine, the reheating furnace, the rolling mill and other auxiliary equipment.

In terms of money the rehabilitation stands as follows:

1. Cost of engineering and machinery on site US$ 12.1 million

2. Cost of civil works (approx) US$ 3.7 million

3. Cost required to complete US$ 5.8 million

The oxygen plant and the bolts and nuts plant have been erected and commissioned. Funds are also urgently required for initial working capital, commissioning expertise, personnel training and at least first year's operation spare parts. A minimum of US$ 5.8 million is required to cover the above requirements as indicated.

4. MODERNIZATION ASPECTS

The main rehabilitation objective is to refurbish and partly modernize the steel plant so as to facilitate operation at the following capacities:

(i)	Molten steel -	25,000	tpy
(ii)	Rolled steel -	20,000	tpy
(iii)	Strips and wires -	500	tpy
(iv)	Bolts and nuts	250	tpy
(v)	Oxygen plant -	48,000	cylinders per year

To achieve the above outputs, some modern techniques have been incorporated in the rehabilitation programme, the most prominent being a two strand continuous casting plant. This will replace the old technique of casting ingots in moulds. However, the casting pit facilities will be retained for emergency handling of liquid steel when there are problems on the continuous caster. The rolling mill will be modern and probably the only one of its kind in the PTA region.

A modern oxygen plant has already been commissioned.

A cold forging bolts and nuts plant has been commissioned replacing the old hot forging plant. This is a saving on heating fuel bill.

5. UNDP/UNIDO PARTICIPATION

The rehabilitation of EASCO is of great interest to Uganda. This is

demonstrated first by the special attention that President Yoweri Museveni has given to the project, second by the amount of money the Government has spent to bring the project to where it is and thirdly by involving UNDP/UNIDO in various aspects of EASCO rehabilitation. Since 1986, four UNIDO experts have separately and at separate times participated in the rehabilitation effort. These experts were:

1. Mr. P. Merh 1986-87
2. Mr. Gawlikowics 1987
3. Mr. K. Hawes 1989
4. Mr. G. Polson 1991

EASCO appreciated their effort and that of UNIDO/UNDP.

There is still room for participation especially in areas of personnel training for operation and maintenance of the new plant after commissioning. UNIDO expertise will also be needed in the fields of exploiting of iron ore reserves and possibly in local manufacture of refractories.

6. REHABILITATION DELAYS

EASCO rehabilitation has been delayed mainly by civil works. Machinery started arriving at EASCO in 1985 and ideally civil works should have been ready by then so that machines were installed as soon as they arrived. This would have made commissioning possible early 1988. However, civil works did not start until early 1989. This is because funds for civil works were not secured at the time when machinery and other engineering services were contracted in 1982. Another cause of delay is that the original civil works contractor could not finish the contract and EASCO had to find another contractor to finish off the job.

These delays have not only pushed up the [project cost but have also generated further delays while extra funds are being sought. They have also resulted in the reduction of substantial guarantees which the machinery supplier had agreed to. It is also possible that some materials are deteriorating beyond use as time goes on, especially refractories.

It is important that the rehabilitation is completed as soon as possible. If completed and EASCO runs at full capacity, Uganda will save approximately US$ 8.6 million per annum by not importing rolled steel. EASCO will earn approximately US$ 2 million before tax and finance charges per year.

7. AREAS OF REGIONAL CO-OPERATION

After rehabilitation of EASCO, the scrap melting capacity will shoot to about 30,000 tpy at EASCO alone. Elsewhere, scrap melting capacities o nearly the same amount are nearing commissioning stage/ Eventually there will be a shortage of scrap. The alternative solutions to this scrap shortage will be import of scrap and utilization of local iron ores. Uganda has iron ore deposits near Kabale and Tororo (See exhibit I).

However, to make them usable for the purpose of production of steel is a

substantial task which needs co-operation at the regional level, say PTA area. Another area where co-operation is needed is in the manufacture of refractories. Operations at EASCO after rehabilitation will need refractories for the electric arc furnace, ladles, casting pit, tundishes, reheating furnace and other areas where insulation will be needed. If there is co-operation it may be possible to get these refractories from within the PTA region.

8. CONCLUSION

Steel production is a national issue and a hinge to all manufacturing and the related industrial development. The rehabilitation of EASCO is therefore very important to Uganda and the Government has demonstrated this eat every stage of rehabilitation. The US$ 12.1 loan was from Italy to the Government of Uganda who passed the loan to EASCO.

The US$ 3.7 million for doing civil works has been paid by the Ugandan Government.

The Government is seriously looking for the balance of US$ 5.8 million needed to complete the rehabilitation of EASCO.

The issue of scrap raised hope for the exploitation of the iron ore reserves in Uganda, a task which calls for regional co-operation amongst PTA countries.

We can see ourselves at EASCO being dragged into the important tasks of exploiting iron ore resources in the region and possibly making refractories.

We see this with great pleasure and are already together with out Ministry of Industry and Technology and some departments in the President's office seriously thinking of iron ore processing. We need co-operation with similar industrial units in the region. WE need a rehabilitation EASCO. We are determined to push the rehabilitation of EASCO to the end. The pace may be slow, but it is sure and forward.

BRIEF REPORT ON THE REHABILITATION OF ZIMBABWE

IRON AND STEEL PLANT (ZISCO)

by

Mr. Van Rensburg, Manager

Mr. Van Rensburg presented a brief report on the rehabilitation of Zisco in which he described the set up of the company, the machinery and equipment, and the capacity and the range of products produced in various mills within the plant.

It was noted that

(a) The rehabilitation programme at ZISCO which was estimated at ZM$ 200 million in mid-1080 now had escalated to over ZM 1 billion.

(b) This rehabilitation programme would include:

(i) the installation of new sinter plant to produce 5,000 tons of sinter per day;

(ii) The complete relining of No. 4 blast furnace between the period April - June 1992. The iron production will be adversely affected until the relining is completed;

(iii) Two new batteries of coke ovens have been constructed;

(iv) New chemical plants to be installed to produce benzole, naphtalene and xylene;

(v) Continuous caster with extra-strand would be installed to enable faster casting

(vi) Phasing out of conventional routes of ingots to continuous casting route.

(c) Bar and rod mill current input at 110 mm^2 to be increased to 160 mm^2 which will require a new furnace. The ultimate objective is to increase the present capacity of 130,000 tpy to 250,000 tpy.