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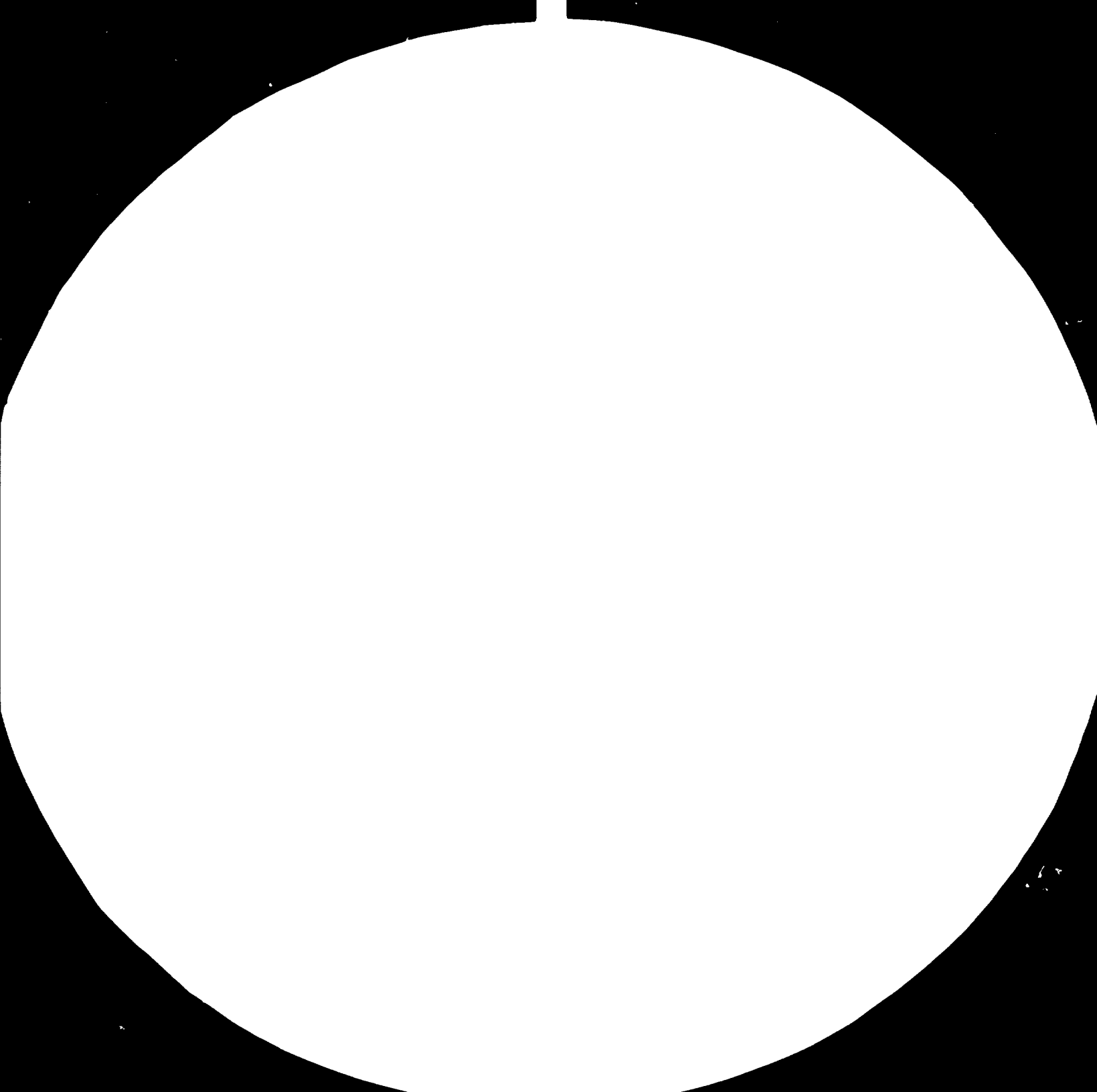
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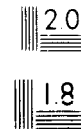
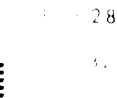
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SECOND REPORT

12962

Sudan. ON  
EXPANSION AND MODERNIZATION  
FOR  
KHARTOUM CENTRAL FOUNDRY.

SI/SUD/82/803/11.01

Prepared by

G. Lamb

UNIDO Project Co-ordinator

at

Khartoum Central Foundry

Khartoum

July 1983

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This report has not been cleared with the United Nations Industrial Development Organisation which does not, therefore, necessarily share the views presented.

1443

EXPLANATORY NOTES:

1 Local Currency: Sudanese Pounds £S.

2 £S 1.00 equals \$ U S 1.3

3. Abbreviations:

Skoda export: Skoda Export  
Foreign Trade Corporation  
Praha, Czechoslovakia

K.C.F. : Khartoum Central Foundry

T.N.O. : Nederlands Technical Organization.

ACKNOWLEDGEMENT

During the stay in the Sudan, the expert was accorded extensive and willing co-operation at all levels. Management and Staff at KCF were particularly helpful.

Guidance and advice from SIDFA. Dr. Paavo Harju contributed usefull, in coordination with other UNIDO experts in the field: much help was obtained from Mr. Tom Wright, Dr. R. Saleh and Dr. Roy Nield.

The consultant wishes to thank Mr. A. Rauf A. Atti, official counterpart for his excellent support.

Organization and official arrangements were made almost exclusively by Miss C. Oimann. J.P.O., to whom most grateful thanks are due.

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ABSTRACT

A 1 - month Mission forming the second of a 3 tours designed to furnish Phase II of the project to upgrade the Facilities of Khartoum Central Foundry. during which, by appointment of a Project Co-ordinator, assistance will be given to counterpart staff in planning and implementation.

Projected delivery of revisions is preliminary proposals did not materialize. Meetings at the Netherlands Embassy defined a revised and delayed programme of financial assistance. No offer or revised contract had been received by K.C.F. from skodaexport.

Following discussion with Mr. Awad El Karim Idris, Special Adviser to the Minister of Industry a programme was developed for detailed investigation of actual future market for products of the expanded facilities.

Advice was given regarding current manufacturing problems identified by the General Manager, Mr. Atti.

Recommendations are made for technology improvements in current operating procedures.

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## INTRODUCTION

In 1970 upon an agreement between UNIDO and the Government of Sudan, Khartoum Central Foundry and machine shop was established using a Yougoslav Contribution.

Costing requirements continue to be greater than production: UNIDO completed a design study in 1981; funds are to be secured by the Sudanese Government from bi-lateral agreements.

Following a Sudanese request a 6 m/m mission was approved; the first part was involved in August/Septemeber 1982 and a report was published.

Beccuse of a contract existing between K.C.F. and Skodaexport the mission objectives were re-oriented.

Subsequent to a Nederlands Field Investigation Mission the project parameters have been re-aligned so that melting and iron foundry production facilities are expected to be furnished from a frount-in-aid from the Nederlands Government and the machine shop with non-ferrous foundry provided from a Czechoslovak soft loan.

During tne second part of the mission the position of the respective parties have been examined, and an opportunity taken to examine market needs.

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RECOMMENDATIONS

1. Further progress in planning the implementation must await Netherlands Government agreement with the Sudanese Ministry of Finance and Planning.
2. Definition of the Skodaexport scope of supply should be urgently sought.
3. Early start of a training programme in existing foundry should receive high priority.
4. Inclusion of a Special Processes Section should be considered following visits to textile, tannery and sugar factories. S.G. Iron, steel and furane processes should be envisaged in a future expansion.
5. Existing pattern shop should be expanded to permit more effective technological control in the current foundry operations.
6. A customer liaison technical function should be established to improve technical interchange at the order phase.
7. Instal a plain shear in stockyard of expanded facilities to cut down motor vehicle pressings up to 2 mm thick.

1. Review of Progress: September 1982 - July 1983
  - 1.1 Significant changes have been introduced since the first part of the mission was completed in September 1982.
    - 1.1.1 A formal proposal has been made by the Netherlands
    - 1.1.2 A revised proposal has been discussed with Skodaexport of Czechoslovakia
  - 1.2 In the Sudan view of the present state of the project may be summarized as:
    - 1.2.1 Melting and foundry production plant to be provided by Netherlands aid
    - 1.2.2 Machine shop and non-ferrous foundry plant to be provided from Czech soft loan.
  - 1.3 The Netherlands offer was contained in a proposal document by T.N.O. of Netherlands and accompanying letter of 23 February from Charge d'Affaires offering proposals for project implementation.
  - 1.4 The Czech agreement to revise the scope of supply was reached verbally during meetings in Khartoum, March/April 1983.
  - 1.5 Definition of the Sudan (K.C.F) position is contained in Annex IV
    - IV (i) copy of letter to Netherlands Embassy
    - IV (ii) copy of letter to skodaexport
  - 1.6 Position at 6 July 1983.

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1.6.1 Following a meeting at the Nederlands Embassy, Khartoum.  
it was reported that inclusion of funds for K.C.F. project  
may be expected to feature in March 1984 bi-lateral  
agreements.

1.6.2 Following the letter (Annex IV (ii) K.C.F. now awaits  
the offer requested in item 8.

## 2. Forecasts of Implementation

### 2.1 Site Work

Ground has been broken, footings and civils works are in progress.

### 2.2 Nederlands Aid

It is foreseen that allocation of finance is possible from March  
1983, subject to maintenance of priorities by both governments.

### 2.3 Czechoslovak Assistance

No forecast is offered since the revised contract requested by  
K.C.F has not been received.

## 3. Market Forecast

3.1 Because of delays in receipt of technical details from both  
Assistance sources the opportunity was taken to explore possible  
market outlets.

S.I.D.F.A. recommended meetings with UNIDO experts now in the  
field in connection with:

- tannery
- textiles
- sugar

With the express objective to examine the possibilities to produce  
castings and spare parts for the designated industries.

../

3.2 Visits were made to:

•  
Kenana Sugar Refinery

Khartoum Tannery

White Nile Tannery

Khartoum Textile Factory

3.3 A range of possible components was identified which includes

- Maintenance replacements
- Breakdown items
- Redesign elements
- Wear and tear elements
- Consumables in Iron, bronze and aluminium.

3.4 From a meeting between UNIDO experts it appears that the market size in textiles is larger than expected and should extend to snap-flask moulding process. Also the type and style of spares for the sugar plants suggests larger unit size coupled with special processes. Steel and S.G. Iron are required and moulding by furan and cold set would be advantageous.

3.5 In the limited cases where K.C.F. has in the past been invited to supply. or has actually supplied customers alledge grounds for concern regards quality prior and delivery. K.C.F. General Manager will follow up these points.

It is essential that the foundry must not be pressed to supply ahead of its capability in either technology or facilities.

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4. Assistance in Improving Current Operations

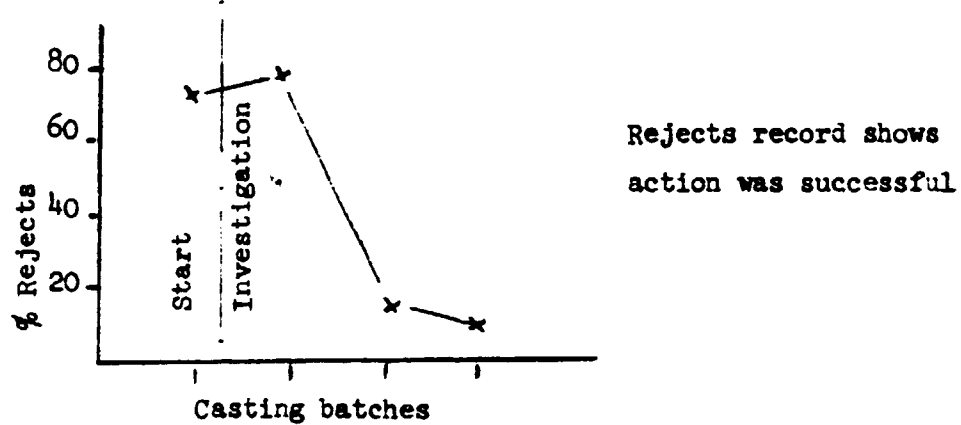
4.1 At the request of the General Manager a programme of assistance was adopted for four particular problems.

4.2 14" A.C. detachable fittings

The principal problem is with the clamping rings.

Most persistent problem is - run of metal. Observed some moulds with 2 and 3 ingates

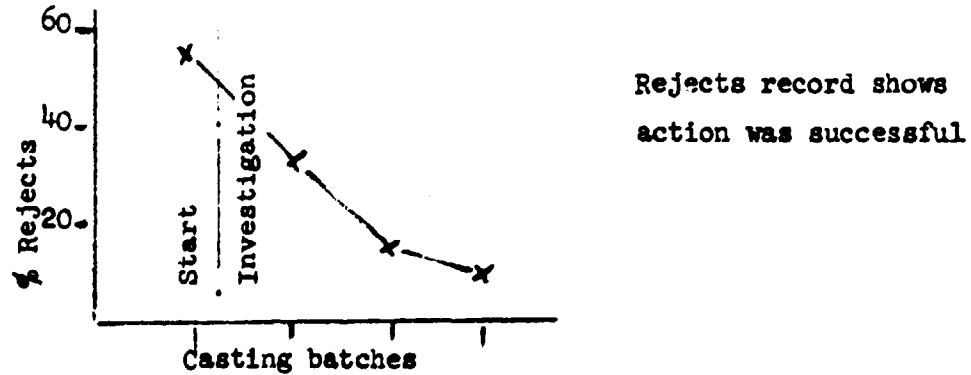
Designed new gating system for 4 ingates



4.3 200 mm diameter clutch ring

Principal problems: shrinkage, dirt, slag.

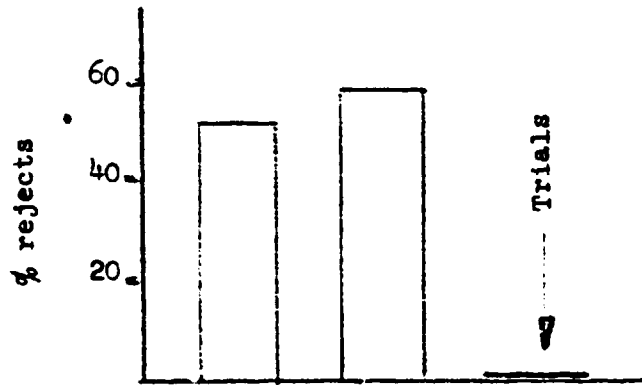
Designed suitable technology for production



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4.4 Manhole Covers

Most persistent problem is mis-run of metal  
K.C.F. had redesigned new Gating System



In available time, trials only possible.  
No rejects in trial castings.

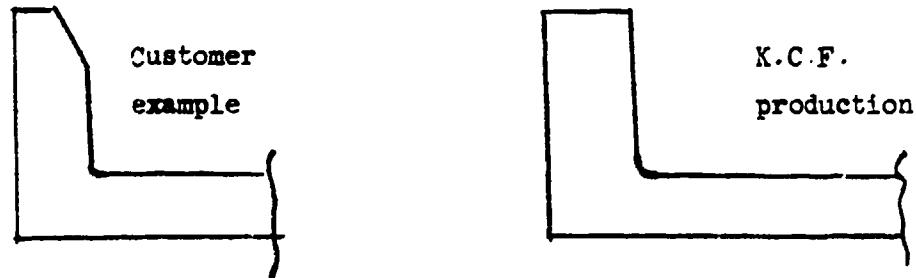
Casting batches

4.5 Ginning mill gear sprocket

Two castings produced are about 9/10 mm in error.  
Casting sales value £s 1300 each. Measurements from pattern indicate error is failure to appreciate effect of machining addition. Demonstrated improved method of drawing. Recommend customer be approached to accept modified component. Method of reducing error demonstrated.

4.6 Textile box casting.

Customer complaints concerning dimensions. Sample casting not in agreement with worn example provided.



Recommend more careful analysis of customer requirements before commencing production.

Approximately 40 pieces have been produced. It would be better to submit sample and obtain approval before production commenced.

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Annex I - International Staff.

Vienna	Mr. M. Czub	SIDO Metallurgical Section
	Dr. P. Harju	S.I.D.F.A. Khartoum
Nederlands Embassy	Mr. I.M. de Jong	Charge d' Affaires
Khartoum	Ms. C. Oimann	J.P.O

Annex II - COUNTERPART STAFF

Ministry of Industry	Mr. Awad El Karim Idris	Special Adviser to H.E. Minister of Industry
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Khartoum Central Foundry

Mr. A. Rauf A. Atti	General Manager
Mr. Amin Mohamed	Production Manager
Mr. Mustafa El Sadig	Production Control
Mr. Ibrahim El Haj	Research Engineer
Mr. Badr El Din Hamed	Foundry Engineer
Mr. Gamal Mohamed	Foundry Supervisor
Mr. Abdel Atti	Pattern Supervisor
Mr. Abdel Rahim A. Fadil	Quality Control
Mr. Mohamed Shannan	Melting Supervisor
Mr. Ismail Wida'a Ahmed	Machine Shop Supervisor.

Annex III - Work Programme, 2nd Visit

June

16 Travel to Vienna  
17 Briefing UNIDO, Meeting with SIDFA  
18/19 Travel to Khartoum  
20 K.C.F. Review Current situation  
21 K.C.F. Prepare programme for 4 items  
22 Meetings, Ministry of Industry, Mr. Idris  
23 KCF Meeting to introduce solution to problems  
24 -  
25 K.C.F. Design Gating for clutch ring  
26 K.C.F. Review Ginning Gear Problem  
27 Visit Mechanized Agricultural Corporation  
28 Visit Khartoum Tannery, White Nile Tannery  
29 K C F. Production Technology meeting. Observe proving trials  
30 Travel to Kenana. Visit Kenana.

July

1 Return Travel from Kenana  
2 K.C.F. review rejects  
3 ( Meeting. UNIDO Experts, Textiles and Tannery  
( K.C.F. prepare moulding programme  
4 Meeting, Nederlands Embassy Mr. de Jong  
5 K.C.F. foundry quality review  
6 K.C.F. supervise pouring  
7 Visit Khartoum Textile Factory  
8 Report preparation  
9 Report preparation  
10 -  
11 Travel to Vienna  
12/14 De-briefing Vienna  
15 Return Travel



Annex II (1)

Subject: Khartoum Central Foundry  
Modernization and Expansion  
project.

Referring to the feasibility study on the above subject prepared by TNC of Netherland at the request of Sudan Government and the letter of the charge d Affaires dated 23 Feb. 1983 on the same subject we are pleased to convey the following:-

I. Comment of the study

I.1. It is a pleasure to state that the feasibility study as a financial document was comprehensive and complete and the conclusions are satisfactory. It is hence an acceptable base document for the project implementation of K.C.F.

I.2. The technical elaboration for the iron Foundry represent a preliminary design concept only and there for a detailed design and specification is required to be elaborated in order to develop the tender document for the project.

I.2. It is noticed that the changing material storage and handling for melting was not considered in details and further consideration is essential.

I.3. It is also essential to reconsider the moulding technology for producing the cement products outlined in the feasibility study.

2. Project Financing

2.1. After detailed consideration for all financial requirement of the project and the potential resources available locally, and from donor countries it is preferred that total project,

consisting of:

- Iron Foundry
- Non-ferrous foundry
- machine shop

should be co-financed by all the resources available for the project from donor countries Netherland, Checholovakia and Algier.

2.2. The concept of Co-financing is based on treating each of the three units of the project as and independent unit so that any one unit can be excuted\* by one of the doner countries.

2.3. The basis for contracting and excution for any one of the projects by the doners will be ( TURN KEY PROJECT ) delivery according to the parameters of performace stated in the study

2.4. It had been accepted and decided by the Government of the Sudan that the Netherland will finance completely the ( Iron Foundry project) as out-lined by the feasibility study and subsequently detailed in the letter of the Netherland Government.

ذريقتنا صغرى  
من اموالنا  
التي نملكها  
في السودان  
والمساهمة  
من الحكومة  
الى  
المشروع

2.5. The fund allocated by Algier to this pr  
will be part of the finance for the foundry  
Detail will be communicated in due time.

2.6. It had been also decided and an agreement had been reached with Skodaexport that the fund allocated for the K.C.F. project by the Government of Chechoslovakia will be used to finance completely the ( Non-ferrous Foundry and Machine shop) according to Kovoproject design.

2.7. All local finance requirement for the total project will be born by the Sudan Government according to detailed agreement with each doner country. For this purpose <sup>the same</sup> ~~a same of~~ <sup>requested</sup> ~~has been~~ <sup>included</sup> ~~is~~ 2,529,334 (Sudanese Pounds) ~~was included~~ <sup>in the Development budget of K.C.F. for 1983 1984.</sup>

approval

3. Implementation concept and schedule

3.1. The implementation concept and schedule here refers only to the "Iron Foundry" as the project which will be excuted by Netherland.

3.2. The project implementation should be on(TURN KEY base) as proposed in the feasibility study in addition to training of local staff

3.3. It is accepted that a consultancy bureau should be in charge of the project preparation and the coordination of project implementation.

~~You are here by requested to select and contract for this purpose.~~

The consultants will be selected by the client after giving recommendations from the UNIDO. UNIDO will assist the client in the selection and contracting process.

3.4. AS to the detailed project design which will have to be made it is preferred, for the sake of speed, that this should be carried out by the <sup>interested bidders</sup> ~~offerors~~ on the basis of the design concept outlined by the feasibility study under the supervision, direction and approval of the constancy bureau within project budget

3.5. ~~The UNIDO roll in the project will be limited to the function of total coordination for individual and all the project between the doner countries. This function will continue to the completion of the project and will be carried out by Mr. Geory Lamb of UNIDO who is assigned to K.C.F. project for this purpose.~~

According to Mr Lamb Contract with UNIDO the remaining finance will cover only additional 4 months. Unless UNIDO agrees to cover finance for the required duration we cannot elaborate further in letters. We prefer

3.5. It is envisaged that the UNIDO expert will <sup>for the remaining</sup> ~~participate~~ <sup>9 months</sup> participate in the following tentative activities as outlined in the project schedule in the feasibility study:

- Preparation of tender document
- Bid Evaluation and Award of contract
- Testing and trial runs.

Time, place and duration for his participation will have to be agreed upon according to your exact schedule of activities for project implementation.

3.6. you are here by requested to start proceedings for project implementation based on the TNO feasibility study and schedule of project implementation as well as points raised in this memoandum.

3.7. You are also kindly requested to start proceedings for securing additional funds according to your estimate of Df 7 m/n for the project implementation .

Finally we would like to express <sup>our</sup> ~~of~~ deepest appreciation for the Netherland <sup>Gov.</sup> ~~ineres~~ and ~~its~~ support in this vital project to the economy of Sudan.

H.E. Minister of Industry.

Mohamed Bashir Elwajie

SKODAEXPORT  
 FOREIGN TRADE CORPORATION  
 DEPART 4I  
 VACLAVSKO nam 56  
 II3 32 praha I  
 CZECHOSLOVAKIA.

~~KHARTOUM CENTRAL~~  
~~FOUNDRY,~~  
~~P.O. BOX 2309~~  
~~KHARTOUM,~~  
 SUDAN.

Date 19.4.1983

Subject: Request for change of  
range of delivery

Referring to the contract initialed ~~in~~<sup>on</sup> 30.6.1982 between this foundry (K.C.F.) and SKODAEXPORT FOREIGN TRADE CORPORATION, and also to negotiations held in Sudan between the representative of the government of Sudan and the representataives of SKODAEXPORT on the 31 of March and the 2nd of Appril 1983 we would like to state the following:-

1. We would like to express our appreciation to you for your declaration to accept the proposal put forward us to ~~accept the~~ change in the range of delivery of machinery and equipments. ( the range of delivery subject of contract should be changed from items 01, 03, 05, 07, I4, I6, and I7, to 02 and 04).
2. We here by request officially that the range of delivery of the intialed contract should be became items (02) and (04) determined by :  
 UNIDO/KOVOPROJEKTA Report of Appril 1981  
 SI/SUD/79/805 entitled (Upgrading the facilities of Khartoum Central Foundry) ( Non-ferrous Foundry) and (Mechanical Workshop).
3. We also request that the range of delivery should include errection of equipment and Machinery specified by items (02) and (04).

4. We request further that the range of delivery should include the commissining of the two plants specified by items (02) and (04) untill handing over in satisfactory operating condition according to the parometers of performanec specified by Kovoproject report.
5. Further the range of delivery should include minimum of training required to take over after commissining by local staff.
6. It should be understood that all civil engineering work will be carried out by K.C.F. according to Kovoporoject design.
7. Foundations of Machinery and equipment will be carried out by K.C.F. according to Skodaexport drawing which should be supplied Six<sup>month</sup> ~~after~~ <sup>coming</sup> contract ~~coming~~ into force.
8. You are here by requested to send your offer in the form of a revised contract for the range of delivery specified in item 2, 3, 4, 5, of this letter taking into account the follwing points.
  - 8.1. The base of estimate for the range of delivery for machinery and equipment should be:
    - Kovoproject estimate
    - your quotation
    - our letter dated 2I.II.I982point(I) price.
  - 8.2. The estimate for each item of machinery and equipment should be seperate.
  - 8.3. The estimate for errection should be broken down to number of men, activities and cost seperately.

- 8.4. The estimate for commissioning should be broken down to number of men, activities and cost seperately.
- 8.5. The estimate for training of local staff should be broken down number of men, activities and cost separately.
- 8.6. Provide a detailed delivery and implementation schedule in the revised contract.
- 8.7. The shortest delivery schedule is most essential
- 8.8. Detailed inspection tests and acceptance procedure should be included in the revised contract.

Your kind and fast consideration and of this request <sup>is</sup> essential in order to ~~finalize~~ <sup>finalize</sup> the contract

Thanking you, we remain,

Your's Sincerely

A. Rauf A. Atti

General Manager  
Khartoum Central Foundry

- Ministry of Industry
- Ministry of finance and economic planning  
( Planning)
- Ministry of Finance and economic planning  
(Purchosing)
- UNIDO
- Attorney General.

ANNEX V - REPORT OF VISIT TO SUGAR FACTORY, KENANA  
30 JUNE. 1 JULY 1983

STAFF:           MR       GARCIA           General Manager  
                  MR R   RICHA           Operations Manager  
SUBJECT: Market Possibilities for K C F expansion  
OBJECT : Identify Suitable spares items for possible  
          K C F production

DESCRIPTION: The visit concerned spare parts and replacement parts under two separate categories:

- 1) Harvesting and field equipment
- 2) In-plant cane processing machinery

The plant has extensive fabrication and machining facilities. The processing season is about 6 months per year; feed rate of cane stock is about 17,000 tons per 24 hour day

The importance of continuous operation was stressed and insistence of proven spares for major production units.

POSSIBLE ITEMS FOR K C F SUPPLY INCLUDED:

Regular Maintenance Replacements	Stock processed
Pump bodies	Raw Material
Pump impellers	Brass sticks
Valves - Recondition exist valves	Bronze hollow bar
Transmission components	
Hubs	
Beering housings	
Drive couplings	
Scrapers	



SCRAP FOR REMELT

About 20/30 tons usable scrap inspected included:

<u>Metals</u>	<u>Condition</u>	<u>Components</u>
Grey Iron	sand castings	Drive train
Malleable iron	die castings	steering
S G Iron	structural	body shells
cast steel	galvanised sheet	radiator segments
Aluminium	pressings	cylinder blocks and heads
Mazak	forgings	carburation elements

Comment:

There is a case for S G Iron and Steel production at K C F for supplies to Kenana and other sugar mills

To process scrap metal, plain shear should be installed in the melting stockyard

ANNEX VI - REPORT OF VISITS TO TANNERY FACTORIES.

28 JUNE 1983

VISIT: KHARTOUM TANNERY

STAFF: MR. TAMBAL General Manager  
MR. ATTIA AGEED Chief Engineer  
MR. A.A RAUF A. ATTI General Manager  
K.C.F. Counterpart  
DR. SALEH UNIDO Tannery Expert  
MS. C. OIMANN J.P.O. (for SIDFA)

SUBJECT: Market possibilities for K.C.F. expansion

OBJECT : Identify Spares items suitable for K.C.F.  
expanded facilities.

Description: A general factory inspection preceded discussion and study of detail spare parts. Equipment was seen in operation and hides were being processed.

Machinery is generally of mixed origin and includes many items each from Yougoslavia, W. Germany, U.K. and Italy.

Possible items for K.C.F. supply included:

One-off breakdown elements	Regular Maintenance replacement	Stock Processed raw material.
Electric motor and casing	5" A.C. fittings bronze sizing wheels	bronze bearings brass rod
Compressor crankcase	vee-pulley wheels	copper head bolts
Compressor cylinders	small levers	
pressure pipes	valve bodies	
Aluminium Spray brackets	steam traps	

In particular, the 5" A.C. fittings now being purchased are of extremely low quality and would require extensive machinery before use; K.C.F. can now produce in finished form.

VISIT: WHITE NILE TANNERY

STAFF:

Engineer Serck	Technical Director
Mr. Marwan	Chief Engineer
Mr. Samir Sidra	Maintenance Engineer
Dr. Saleh	UNIDO Tannery Expert

DESCRIPTION: A general factory inspection preceded discussion of possible collaboration. Equipment was seen in operation and hides were being processed

The installation is reported to be according to Jugoslav design and the civils to have been executed by a Sudanese contractor. Much of the production equipment is of Jugoslav origin; there are some items of other European origin.

Serious problems related to civils and foundations were outlined, which are held to account for 75% of the washing drums being out of use. Repeated support bearing misalignment and movement has resulted in gearbox and drive failure.

Possible items for K.C.F. included:

One-off	regular
breakdown	maintenance
elements	replacements
Gearboxes	bronze sizing wheels
	trip pinions (now plastic, want bronze)
	bronze knife support rollers
	drive pinions.

Comment on existing position of K.C.F. Supply.

In the past both Khartoum and White Nile tanneries have purchased from K.C.F. and both complained about quality, price and service. Khartoum Tannery illustrated the quality complaint by producing a gearbox cooling fan in aluminium and White Nile quoted a 300 mm diameter, 4-groove vee pulley, claiming delivery was one year from order.

Other local castings were inspected and the quality found to be below K.C.F. In particular, at Khartoum Tannery a set of 5" asbestos cement sockets and clamp rings was inspected, in which machining would be necessary before the components could be used.

White Nile Tannery reported that they were quoted over £s 1000 for a replacement gearbox, which they considered expensive.

Annex VII - VISIT TO KHARTOUM TEXTILE FACTORY

7 JULY 1983

STAFF: MR. HAGO MUSTAFA GUMMA D. C. Engineer (Mech.)  
DR. ROY NIELD UNIDO Textile Expert  
MR. A.R.A. ATTI K.C.F

SUBJECT: Market possibilities for K.C F expansion

OBJECT: Identify suitable items for possible K.C.F. Production

DESCRIPTION: The factory has spinning, weaving and finishing facilities and manufactures grey and patterned cloth

Many hundreds of looms and other machines stand abandoned because of maintenance and spare parts shortage

Possibly 65% of spares are cast iron.

Possible K.C.F Supply:

Some 150 to 200 different cast iron items were seen which could be produced by K.C.F both immediately and in the expanded facilities. The necessary survey to identify all the requirements would require 4 - 6 weeks joint study by KCF and Khartoum Textile Factory.

An urgent start should be made to identify a procedure in order to improve the market orientation of the future expanded facilities

No specific recommendation is made because of the field mission of Dr. Roy Nield. It is felt that a wider view may be identified and that Dr. Nield should be consulted in formulation of a policy.



