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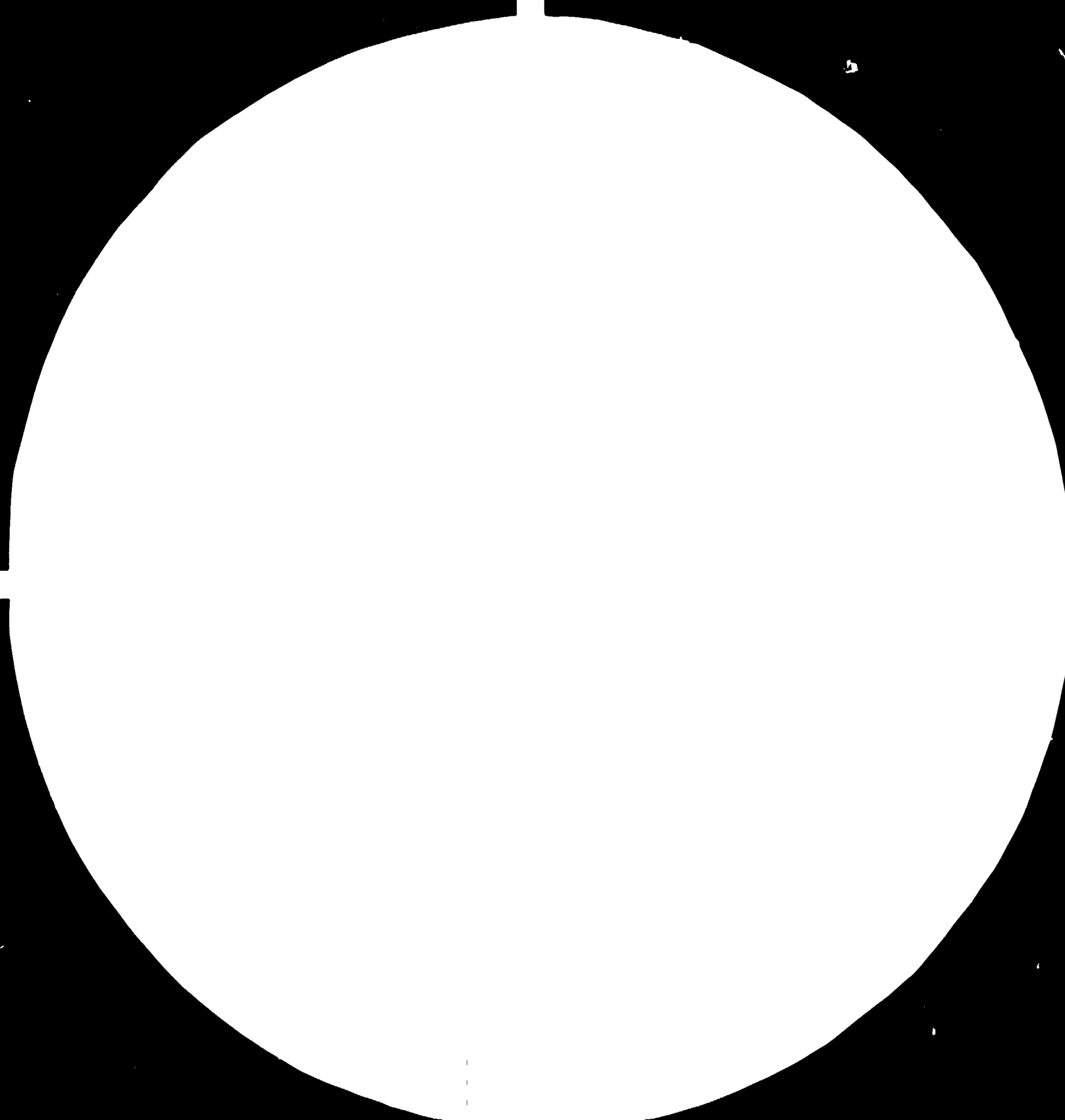

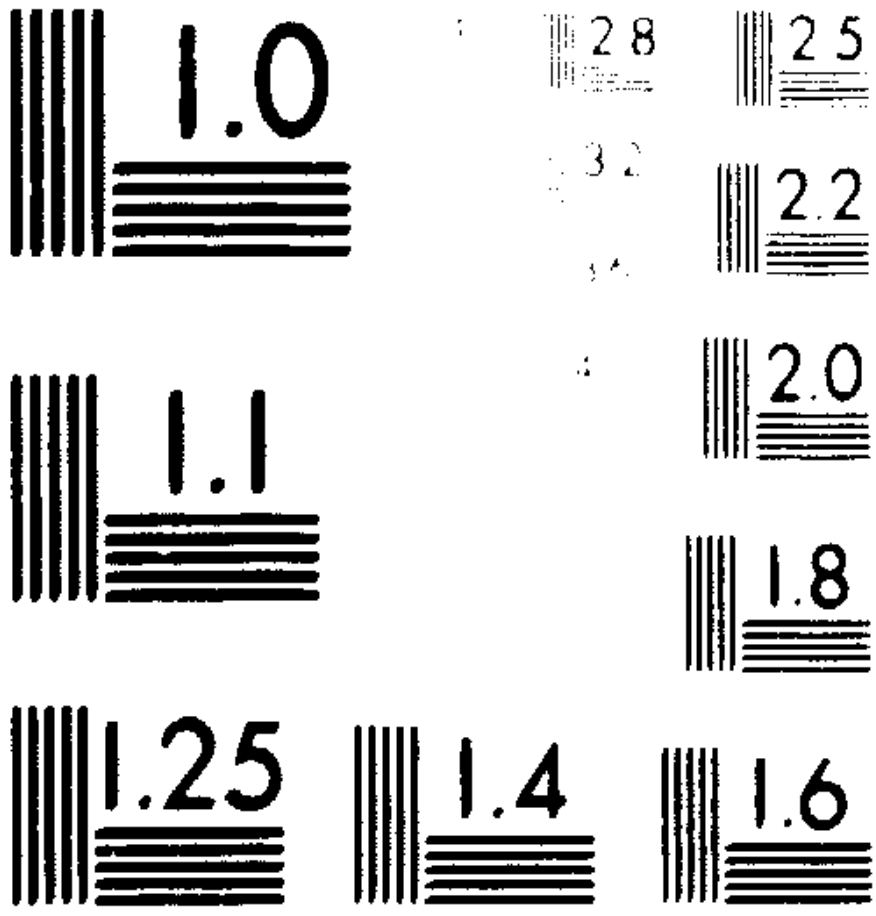

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17 May 1983
English

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China.

ASSITANCE TO MACHINE BUILDING INDUSTRY

DP/CPR/79/021

CHINA

Terminal report*

Prepared for the Government of China
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Ake Hofvenstam,
expert in computer-based machinery databases

United Nations Industrial Development Organization
Vienna

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CONTENTS

ABSTRACT

The work described in this report is a contribution to the Development Programme DP/CPR/79/021 whose purpose is to strengthen the machine tool building industry of the country.

This work on computer-based machining data bases was carried out at the Chengdu Tool Research Institute, Chengdu, Sichuan. The study ran for three months, beginning August 18th, 1982. The main objective was to assist in the design of a computer-based data base to be used in handling machining data recommendations. It is clear that the present level of aids to operation planners and method engineers have serious limitations.

As this computerised data base is a vital part of an information system for machining data recommendations, it is recommended to the Ministry of Machine Building that priority be given to capital investment and the training of the technicians who are to use the equipment acquired. It is also recommended that further UNIDO technical assistance be given to work at the final recommendation of hardware, software and education programme, and to a consideration of financial assistance in the purchase of the equipment. Technical assistance also ought to be directed towards adjacent areas such as education programmes for operation planners and method engineers, training of personnel for tool surveys and tool management within the factories.

1. INTRODUCTION

The duties as origninally defined in the job description for this project are given in Appendix 1.

A preliminary study of the project indicated that the main problems were the transfer of cutting data recommendations to the production units and the instruction of personnel at these units how to use this information to increase productivity.

During discussions with the personnel from the Chengdu Tool Research Institute it was agreed that plant tours should be included in the programme in order to learn first hand how production planners and method engineers work today.

The work itself concentrated on the design of a computerised machining data base, as per the job description and the expressed desire of the institute.

The work programme consisted of the following:

i Technical discussions and presentation of experiences in build-up and use of computerised data bases;

ii The establishment of material classification systems and tool material recommendations for different applications;

iii Design of flow sheet for computer programmes;

- machining data: turning
- machining data: milling

iv Lectures, visits

2. TECHNICAL DISCUSSIONS

The main work was done in a three-man working group to which the main requirements were presented and guidance was given. Alternative solutions which are in use in other countries were presented. The final choice of a solution appropriate to the specific conditions and the structure of the industry in the PRC was left to the working group. Most machine tool factories in the PRC have their own tool production units within the plants. The performance level of the finished tool may vary depending on the manufacturer why specific cutting data recommendations not can be given by the tool material manufacturer.

The following points were especially stressed in the technical discussions:

- System documentation;
  different types of documentation.

- Backup systems;
  different solutions were presented. Fireproof storage necessary.

- Maintenance and updating of in-house developed data base programmes;
  maintenance problems must be considered during programme design.

- Choice of programming language;
  a language which permits structured programming was strongly recommended (e.g. APL, PASCAL and late FORTRAN versions).

A system for storage and retrieval of machining reports will require memory capacity over a ten year period of about 20-30 Mb. Future applications may demand more capacity. It was recommended that the data base management system software for this application is purchased and not developed in-house.

3. DESIGN OF FLOW SHEET FOR COMPUTER PROGRAMMES; CALCULATION OF MACHINING DATA TURNING AND MILLING

Flow sheets with explanations for the specific demands of these two applications have been designed. With these two examples as models, the working group will be able to continue the work to create a system covering other operations and suboperations.

The working group was asked to make a priority list of

a) materials - which materials were most frequently used in the industry and thus most important to include in the system, and

b) suboperations/tool material - which combinations were most important to include in the system.

The coming work has to planned so that the most urgent needs are covered first.

Advice have been given where to find basic (temporary) data to be used until the testing programme is finished.

4. LECTURES, VISITS

A. Four lectures were presented at the Chengdu Tool Research Institute before an audience of engineers and technicians on Tuesday 19th and Wednesday 20th October. The lectures were arranged to encompass as much information possible connected with computerised data bases and the distribution of data to the end users.

i Lecture No. 1. Development Tendencies, Machining Data Bases

The use of computers in design, operation planning, shop loading, estimation and unmanned production will increase in the near future. The economical advantages of these systems are obvious; this is the reason for rapid development. To use these systems, extensive data bases must be available. The development will probably be along the following lines:

- big computer systems for large companies;
- computerised aids for small production units implemented in micro processors.

ii Lecture No. 2. Optimised Cutting Data, Turning

There are two main methods of optimise cutting data:

- cost effective optimisation;
- optimisation to achieve maximum productivity.

The cost effective optimisation can only be done if the cost situation for the production unit is known; this means that the machining cost and the tool cost must be known. This may demand a closer cost follow-up in the production units.

It is recommended that a model be developed to calculate the machining and tool costs. This will enable the implementation of an economical, cost effective optimisation model, to be used of method engineers and operation planners in taking necessary steps to obtain good machining economy. A new method to optimise the cutting data for NC-lathes when more than one tool is used was presented. Calculation exercises according to the method were performed.

iii Lecture No. 3. Distribution of Cutting Data Recommendations.

The structure of the industry in West Europe and North America has lead to a standardisation of tools and a growth of tool manufacturers. A diminishing number of tools used in the workshops are manufactured within the production unit.

In the West the tool manufacturers are held responsible for technical information on the use and maintenance of the tools.

The sales forces and the technical service personnel are organised and trained to give the required support to purchasers. The information flow from the industry and the knowledge of the practical use of the tools is well established within the tool manufacturers' organisation.

iv Lecture No. 4. The Use of Computerised Systems for Cutting Data Applications within the SANDVIK Group

Several systems are in use within the SANDVIK Group.

The main systems are

- systems for registration of measuring data from tests of tools;
- system for storage and retrieval of machining reports,
- systems for calculation of adapted cutting data based on machining tests.

The main goal within the SANDVIK Group is to give as many technical service technicians as possible access to the main computer data bases via a well built up communication net.

B. Visits

The following factories were visited:

- Chengdu Measuring & Cutting Tool Plant, Chengdu;
- Dong Fang Electrical Machinery Works, De Yang;
- Ningjiang Machine Tool Works, Guanxian.

5. OBJECTIVES OF THE NEW MACHINING DATA GROUP

The new group is planned to be established at the Chengdu Tool Research Institute under the section Fundamental Metal Cutting Theory. The purpose of this group will be to issue cutting data recommendations. The recommendations are to be adapted to the local conditions in those workshops where they are to be used. The group also has to support the work of laying down guidelines how to reach optimal cost effective production when using the recommended data.

Collecting and storing of practical experiences, machining data reports, and test report and its retrieval will also be handled by this group.

6. SOFTWARE, HARDWARE AND EDUCATION PROGRAMME

A. Software

i Cutting data calculation system

This software can be developed in-house as guidance has be given in form of flow sheets and as recommendations how to design the files (data base). Programming knowledge is available within the Institute. Memory capacity needed approx. 2 Mb.

ii Machining report storing and retrieval system.

This system must be developed from a purchased product as the development work is extensive. The priority of this project is lower than the system under i).

The detailed study regarding record build-up has to be commenced. With an influx of about 1000-2000 reports/year, memory capacity needed for a 10-year period is about 20 Mb. With these extensive programmes and the amount of data to compute a primary memory of about 2 Mb is needed.

List of software, see Appendix 3.2

iii System for printing of Chinese text.

The use of output from system i) and ii) in the workshops demands heading and text written with Chinese signs. Such systems are under development and ought to be implemented after modification to suit chosen data base management system. Cooperation with institutes or universities developing these systems is needed.

List of software, see Appendix 3.2

B. Hardware

Following hardware is needed:

i CPU, primary memory 2 Mb.

ii Magnetic disc and magnetic tape store with controllers, 20 Mb.

iii I/O equipment

a) Visual display units with keyboard, graphical representation is an advantage but not a need.

b) Floppy disk drive with controller for reading and copying of floppy disks.

c) Punch card reader and puncher. (Endusers request)

d) Line printer suitable for printing of Chinese text.

e) Video terminals.

The hardware must besides be prepared for I/O of external lines (telecommunication) to be used in the future for transmitting and receiving data from remote subcentrals. A sketch of the proposed central, see Appendix 2. List of equipment, see Appendix 3.1.

C. Training Programme

As much training programme as possible ought to be included in the package hardware - software.

In Appendix 4 training programmes from one hardware - software supplier is presented.

7. ORGANISATION

Staffing of the unit for the computerised machining data bases must be adapted to the local situation.

Two main development tasks within this field have to be covered:

- Development of systems for calculation purposes.
- Adaptation of purchases software (data base management system).

There may be considered if a separate computer department/section has to be organised to coordinate all computerised activities within the Institute to be able to use the resources (programmers, system specialists, maintenance specialist, some software and hardware) most effectively.

The drafted system fully build up will need following staffing;

1 system man	+ 1 junior system man
3 development, programmer and technical service men	+ 1-2 junior, programmer
1 maintenance man	+ 1 junior maintenance man
1 operator	+ 1 junior operator
6	4-5

8. FINDINGS

As a result of technical discussions and visits the following conclusions were reached.

1. The fundamental studies of the cutting process conducted within the Institute will in long term prove beneficial.

2. There is a considerable lack of basic data that would be of immediate use to the method engineers and the operation planners. The present system of in-house production of tools hampers the use of centrally issued cutting data recommendations. Testing methods to determine the performance level of the locally manufactured tools must be introduced-

3. Guidelines and manual on how to choose optimal tools and how to use centrally issued cutting data recommendations have to be worked out.

4. To optimise cutting data, some cost effective model has to be established, Guidelines on how to estimate the machining tool costs at the different works has to be laid down.

5. Implementation of methods for tool survey to improve tool management and increase demands of standardisation of tools and tool performance. Introduction of "ready to use" indexable cemented carbide inserts will contribute to both these areas.

9. RECOMMENDATIONS

There is an undoubted and urgent requirement to create updated aid to method engineers and operation planners. A computerised system suggested in this report will contribute to this work. It is strongly recommended to the officials of the Ministry of Machine Building that a high priority be given to this requirement. It is recommended that further UNIDO technical assistance be directed to:

(1) final selection of hardware, software and education programme;

(2) technical guidance in the important decision regarding the final selection and purchase of software for a data base management system;

(3) implementation of methods for tool survey and improvements of tool management, methods and improvements which fit the local conditions;

(4) the development education programmes for operation planners and method engineers.

It is also further recommended that UNIDO give strong consideration to providing direct financial assistance to the investment in hardware and software, especially for the education programme for the technicians who are going to use the hardware and the software.

10. ACKNOWLEDGEMENT

I would like to convey my sincere thanks to all the officials and engineers at Chengdu Tool Research Institute and the various factories for their hospitality, support and kindness in carrying out this mission.

Appendix 1

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

13 January 1982

PROJECT IN THE PEOPLE'S REPUBLIC OF CHINA

JOB DESCRIPTION

DP/CPR/79/021/11-03/31.9.B

Post title Expert in Computer-based Machining Databases

Duration Three months

Date required As soon as possible

Duty station Chengdu

Purpose of project To assist the country to strengthen its machinery building industry by improving the quality of its products, the efficiency with which they are produced and the working conditions in industry. This will increase the rate at which the industrialization programmes can proceed and will also help to increase productivity in the agricultural sector.

Duties The expert will work in co-operation with the Chengdu Tools Research Institute of the First Ministry of Machine Building and will specifically be expected to:

1. Assist in the design of a computer-based machining database;
2. Provide technical guidance on the operation of machining databases in other countries;
3. Give advice on the organization, management, method of use, financing, staffing and operation of a computer-based database;
4. Give lectures on the design and operation of databases;
5. Assist in the design of a computer-based machining database.

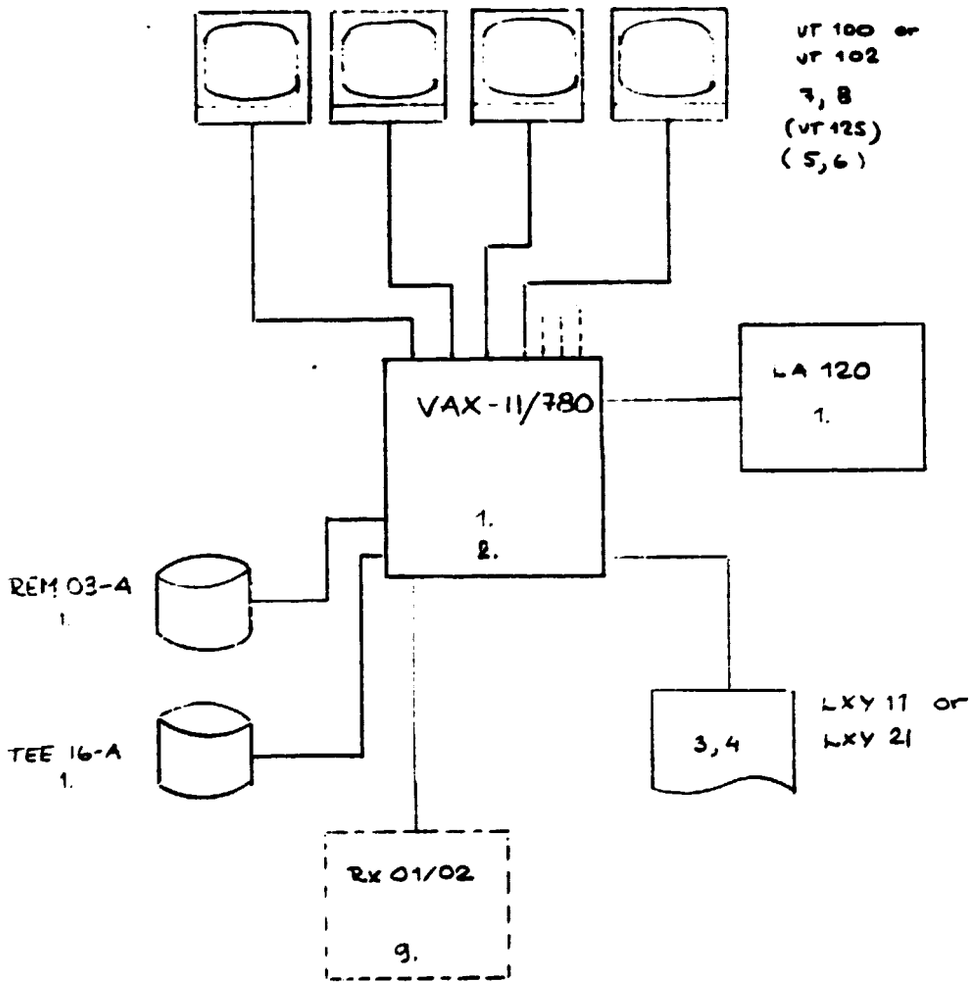
..../..

Applications and communications regarding this Job Description should be sent to:

Project Personnel Recruitment Section, Industrial Operations Division
UNIDO, VIENNA INTERNATIONAL CENTRE, P.O. Box 300, Vienna, Austria

	The expert will also be expected to prepare a final report, setting out the findings of the mission and recommendations to the Government on further action which might be taken.
Qualifications	Sound background in metal-cutting technology; familiarity with the design and operation of a computer-based machining database.
Language	English
Background Information	The Chengdu Tools Research Institute, which employs approximately 600 persons, is mainly concerned with the design of cutting tools and methods for their manufacture; it also carries out work on measuring instruments, particularly for gears. Research is carried out on machinability and on the theory of metal-cutting, and special cutting tools - coated carbide, ceramics, conducts research work on methods for the production of these tools.

System Sketch



Indices, see Appendix 3:1

Appendix 3.1

Proposal to hardware with alternatives

1 SV-AXTVC-CD
* VAX-11/780
* CPU 1,0 Mb
* REMO3-A 67 Mb disk and controller
* TEE16-A 45 ips 800/1600 tape unit and MBA
* QE001-A VAX/VMS operating system
* H9602-DF unibus option cab
* BA11-Ke exp box 5 system units
* DD11-DK two system units backplane
* DZ11-A 8 line EIA interface
* LA 120 console terminal

2 MS780-C
* 1,0 Mb ECC MOS exp memory

3 LXY11
* Printer 300 lines/min

4 LXY21
* Printer 600 lines/min

5 VT125-CJ
* Graphics terminal VT125 and software QE118-XY

6 VT125-AB
* Graphics terminal VT125

7 VT100
* Video terminal

8 VT102
* Video terminal with advanced video and printer port (Alternativeto item 7)

9 RX01/02
* Dual disk drive

Item 5 and 6 for graphic representation.

Proposal to software

1.	Operating System, see item 1:5 Appendix 2		
2.	VAX-11 BASIC	(QE096-AY)	(optional)
3.	VAX-11 COBOL	(QE099-AY)	(opitonal)
4.	VAX-11 FORTRAN	(QE100-AY)	
6.	VAX-11 COMMON DATA DICTIONARY	(QE897-A4)	
7.	VAX-11 DATATRIEVE	(QE898-AM)	(optional)
8.	VAX-11 DBMS	(QE899-AM)	
9.	VAX-11 FMS	(QE701-AY)	

Minimum system requirements are maybe not fulfilled for some of these software, why the supplier has to give his recommendation.

VAX Customer Training

DIGITAL provides comprehensive educational programmes to train personnel before, during, and after installation. Instruction in system management, operations, hardware, and software are available in five formats:

1. Lecture/Lab Instruction - Provides traditional classroom lectures and laboratory experience at one of Digital's 26 Training Centres worldwide.

2. Self-Paced Instruction (SPI) - Self-Paced courses offer training materials that are portable, self-contained, and modular in format. They are educationally designed so that students can progress at their own rates. SPI courses are offered in three formats:

3. On-Site Training - On-Site courses can be adapted to cover particular application or operational needs in depth. Every lecture/lab course offered by Educational Services can also be taught at the applicant's job site.

4. Exclusive Courses - If a person has a unique application, Educational Services can create an exclusive course tailored to the person's needs.

5. Technical and Management Seminars - Management seminars are specifically designed for non-technical personnel to enable them to better understand data processing and how to use its capabilities. Technical seminars are a series of state-of-the-art programmes aimed at DP professionals and managers focusing on the newest applied technologies.

The courses listed below were designed by Digital's Educational Services Department to address the specific needs of VAX systems users, operators, programmers, managers, and maintenance personnel.

VAX/VMS Software Training

Introduction to Minicomputers (L/L,A/V)
Commercial Programming Concepts (L/L)
VAX-11 Concepts (Lecture, A/V)
VAX-11 Instruction Set (Lecture, A/V)
VAX/VMS Utilities and Commands (L/L,SPI)
VAX/VMS System Management (L/L)
Assembly Language Programming in VAX-11 MACRO (L/L)
Programming in FORTRAN IV (L/L, SPI)
BLISS Primer (SPI)
Programming in PDP-11 COBOL (L/L)
Programming in BASIC-PLUS-2 (L/L, SPI)
Programming VAX/VMS in VAX-11 FORTRAN/MACRO (L/L)
Programming VAX/VMS in VAX-11 BASIC (L/L, SPI)

Programming VAX/VMS in VAX-11 COBOL (L/L, SPI)
VAX/VMS Operating System Internals (Lecture)
VAX/VMS DECnet User (L/L)
VAX/VMS Device Driver (L/L)
Programming in VAX-11 Datatrieve (L/L)
VAX-11 DBMS Data Base Administrator (L/L)
VAX-11 DBMS Programmer (L/L)

DECmail Training

DECmail Instructor Course (SPI)
DECmail Instructor (On-Site)

VAX Hardware Training

Introduction to Minicomputers (L/L, A/V)
Introduction to Digital Computer Logic (L/L, A/V)
VAX-11 Concepts (Lecture, A/V)
VAX-11 Instruction Set (Lecture, A/V)
VAX-11/750 Hardware Diagnostic User (L/L)
VAX-11/780 Hardware Diagnostic User (L/L)
VAX-11/780 Processor Internals (L/L)

For further details regarding dates, times, locations, and costs, as well as information about training credits available to Digital customers, the Digital Training Centre or Account Representative should be contacted.