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21033

Final Report

327-02/02

**Project
DG/CPR/91/325**

**"Modular design
of a Family
of small to medium size
Machining Centres"**

Contract No 91/249

Stuttgart 27.3.95

Dr.-Ing. Thomas Rudlaff

1. Introduction and scheduled project activities

The overall aim of the UNIDO-Project (DG/CPR/91/325) is the development of a prototype for a machining centre in modular design by the chinese company Jinan First Machine Tool (JFMT).

The project starts with a visit of a delegation of staff members to germany, including visits to several major manufacturers of machining centres.

The Zentrum Fertigungstechnik Stuttgart (ZFS) together with a Chief Technical Adviser (CTA) will assist JFMT in planning, conceptional phase and with the first scaled rough design during a training of JFMT trainees in Stuttgart. This training is organized and performed by ZFS.

The machine will be designed, manufactured and assembled by JFMT in China, after the training in Germany. Then the machine shall be taken into operation and initial tests should run. The goal is to have an operating prototype by the end of the project.

JFMT will be assisted by the CTA who will come twice to China after the training on fellowship. The conditions for the first field mission of the CTA are the finished assembly drawings, which should have been sent to the CTA before the start of the field mission. The second field mission is sheduled before the end of the project with the purpose of evaluating the results of function and machining tests and suggesting improvements. This mission should take place after the results of the tests have reached the CTA.

This project aim and rough schedule was clarified and fixed by the proposal of 10.10.1991 and during a project clarification trip by Mr. Matten in January 1992.

Due to this, the following services which had to be provided by ZFS were fixed:

<u>Service</u>	<u>Scheduled date</u>
1. Project management	During Project
1.1 coordination of training schedule with national project director (NPD)	
1.2 arrangement of suitabel accomodation and training facilities in germany	
1.3 briefing and debriefing of staff	
1.4 communication services	
1.5 reporting to UNIDO	
1.6 home expert support	
2. Study tour	November 1991
2.1 arrangement of visits to companies and institutions	
2.2 local travel and transportation	
2.3 communication services	
2.4 accompaning engineer	

Service	Scheduled date
3. Training of a group of 8 technical staff members over a period of 6 months Training programme:	6 months earliest start: 7.1.92
3.1 introduction to terminology and general overview	
3.2 analysis of horizontal machining centres made in germany	
3.3 drives and control for machine tools	
3.4 introduction to systematic modular design of machining centres	
3.5 effect of tooling, tooling systems and processes on the concept of machining centres	
3.6 determination of performance specifications and concepts	
3.7 design of components for overall modular design	
3.8 design of concept for prototype	
3.9 introduction to FEM method to predict static properties	
3.10 practical training in verification of structural behavior using FEM	
3.11 introduction to kinematics simulation	
3.12 set up of plan for further development steps, definition of milestones	
4. Expert services, field missions	during project
4.1 technical advising on specifications	
4.2 consulting during training and prototype design	
4.3 1. field mission of CTA to Jinan	1 year after training
4.4 2. field mission of CTA to Jinan incl. final report	after finish of prototyp

The project was offered at fixed cost basis, whereas the following costs were scheduled for the different project steps:

	Service	Scheduled costs in DM	payment upon completion
1	Project management (after discount of 20.000)	24.000	518.000 (splitted in several amounts)
2	Study tour	14.000	
3	Training programme at ZFS - costs for ZFS staff and training equipment - costs for transport and accomodation of 8 trainees	243.000 159.760	
4.1-4.2	Costs for CTA (excluding field missions)	76.500	
4.3	Costs for field mission 1	30.000	30.000
4.4	Costs for field mission 2 including final report	45.000	44.260
	Total	592.260	592.260

2. Review of project

2.1 Time review

- 10.10.91 Revised Project Proposal sent to UNIDO
- 11/91 Organisation of study tour in germany, where members of JFMT had the opportunity to see state of the art technology in Germany.
- 01.12.91 Acceptance of Unido contract 91/249 "Modular design" by ZFS
- 10.-15.1.92 Visit of Mr. Matten (ZFS) to Beijing to clarify the project. During this mission the following objectives were handled:
- discussion of training curricula
 - determination of project milestones
 - examination of professional and linguistic skills of trainees
 - clarifying status of passports and visas of trainees
- 07.02.92 Final signature of contract
- 02.04.92 Arrival of 8 trainees in Stuttgart. At this time the documentations for the trainings-courses in english were prepared and ZFS staff had helped the trainees in visa problems.
- 4/92-10/92 The courses were conducted. They were divided into two parts, a lecturing period of 7 weeks and a conceptual design period of 19 weeks. All organisation including accomodation, transports and others was managed by ZFS.

For the lectures a script was prepared with the following topics:

- Introduction
- Analysis of Machining Centres
- Electrical equipment and controls of Machining Centres
- Machine application
- Introduction to Systematic Modular Design

The lectures were held by staff from ZFS and University of Stuttgart.

The construction of the machining center was divided into different tasks, where the trainees worked in teams. The work was assisted by the CTA, Mr. Burkhard from Ex-Cell-O. A modular design machining centre with a 500mm x 500mm worktable and swivel-type tool changer was conceived. The work finished with drawings of machine concept.

At the end of the stay milestones for the further developments in China were set up. After completion of this milestones the 1st mission of the CTA shall take place.

During the stay in Germany ZFS organized the following visits to major producers of machining centres:

- Wanderer, Munich
- Heller, Nürtingen
- Ex-Cell-O, Eislingen
- Burkhardt & Weber
- Maho, Pfronten

During the visits a large variety of machine concepts, development stages, design details, subassemblies and assembly were presented. The visits were accompanied by the CTA, who pointed out important items.

Additionally visits to Mercedes Benz, Stuttgart and to two major Machine Tool fairs in Germany, the METAV (Düsseldorf) and the AMB (Stuttgart) were organized.

- 01.10.92 Final meeting with the trainees in Stuttgart.
- 03.10.92 Depart of the 8 JFMT trainees from Stuttgart, accompanied by Mr. Eggert (IFW, University of Stuttgart) and Mr. Voigt (ZFS). The original drawings were taken by the group directly. Other information materials (catalogues etc.) were shipped to Jinan.
- 28.03.93-
12.04.93 1st field mission of CTA to Jinan.
To provide technical support and consultation for finalisation of the design of the Machining Center, the CTA and Mr. Matten travelled to China for field mission. After this mission the CTA stated the following facts:
- the engineering drawings were not finished yet,
 - the degree of completion was varying,
 - there is a concern that the project might not be getting the required attention from management, due to a cooperation with MAHO. (Remark: JFMT bought a whole production line from MAHO),
 - the final assembly drawings should be send to CTA after completion,
 - milestones for the fulfilment of the project were drawn up, which reached up to May 1994, where the prototype should be set up and the initial testing should be completed. After this the second field mission should take place.
- 5/93-7/94 The assembly drawings and machine drawings were not send to germany after the second field mission. They were reminded several times by Mr. Voigt in China, but never arrived in Stuttgart. Also no progress reports were send to Stuttgart, even after several reminders.
- 26.08.94 Information of ZFS to Dr. Gürkök (UNIDO/Vienna) about missing project proceedings from JFMT
- 06.09.94 Receivment of facsimile from JFMT (Mr. Peng Xinpei):

"According to the opinion of the experts group ... it is unnecessary for JFMT to make the prototype for this project. ... This means, that it is unnecessary for Mr. Burkhardt to make the second field mission."

ZFS informed UNIDO about this facsimile the same day.

07.03.95 Information from Dr. Gürkök, which confirm the finalization of project due to consultations with JFMT authority.

2.2 List of project reports send to UNIDO

22.01.92 Mission report (Dipl.-Ing. Matten)
27.02.92 Project Progress report (Dipl.-Ing. Matten, Dipl.-Ing. Voigt)
01.04.92 Monthly progress report (Dipl.-Ing. Matten, Dipl.-Ing. Voigt)
30.04.92 Monthly progress report (Dipl.-Ing. Matten, Dipl.-Ing. Voigt)
29.05.92 Monthly progress report (Dipl.-Ing. Voigt)
30.06.92 Monthly progress report (Dipl.-Ing. Voigt)
31.07.92 Monthly progress report (Dipl.-Ing. Voigt)
31.08.92 Monthly progress report (Dipl.-Ing. Voigt)
05.10.92 Monthly progress report (Dipl.-Ing. Voigt)
02.11.92 Monthly progress report (Dipl.-Ing. Voigt)
02.12.92 Monthly progress report (Dipl.-Ing. Voigt)
05.02.93 Report (Dipl.-Ing. Voigt)
25.05.93 Mission Report about 1st field mission (Dipl.-Ing. Burkhardt)
Mission Report (Dr. Matten)
Revised Project Milestones
27.3.95 Final report (Dr.-Ing. Rudlaff)

2.2 Review of finalized working points regarding work plan from proposal

The following points are successfully finished according to working plan and project reports:

1. Project management
2. Study tour
3. Training of a group of 8 technical staff members
- 4.1/4.2 Expert service of CTA during training
- 4.3 1st field mission of CTA

The following project point could not be finished:

- 4.4 2nd field mission of CTA and preparation of final report

Here the 2nd field mission could not be performed by the CTA, due to the wish of finalization of project from JFMT. The final report was prepared by ZFS.

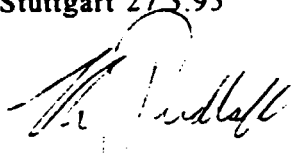
3. Final cost invoice

Since JFMT did not want a 2nd mission of CTA (Mr. Burkhardt) and doesn't want to build the prototype machine, the project has to be finished without the 2nd field mission. Due to this, the scheduled costs can be reduced by DM 20.000,--.

To fulfill the contract 91/249 the final report was presented. We provided UNIDO with all progress reports and therewith fulfilled the contract. So we request the last payment for the contract 91/249 of DM 24.260,--.

By acceptance of this final report by UNIDO we will present a formal invoice about the above mentioned costs.

Stuttgart 27.3.95



Dr.-Ing. Thomas Rudlaff
general manager