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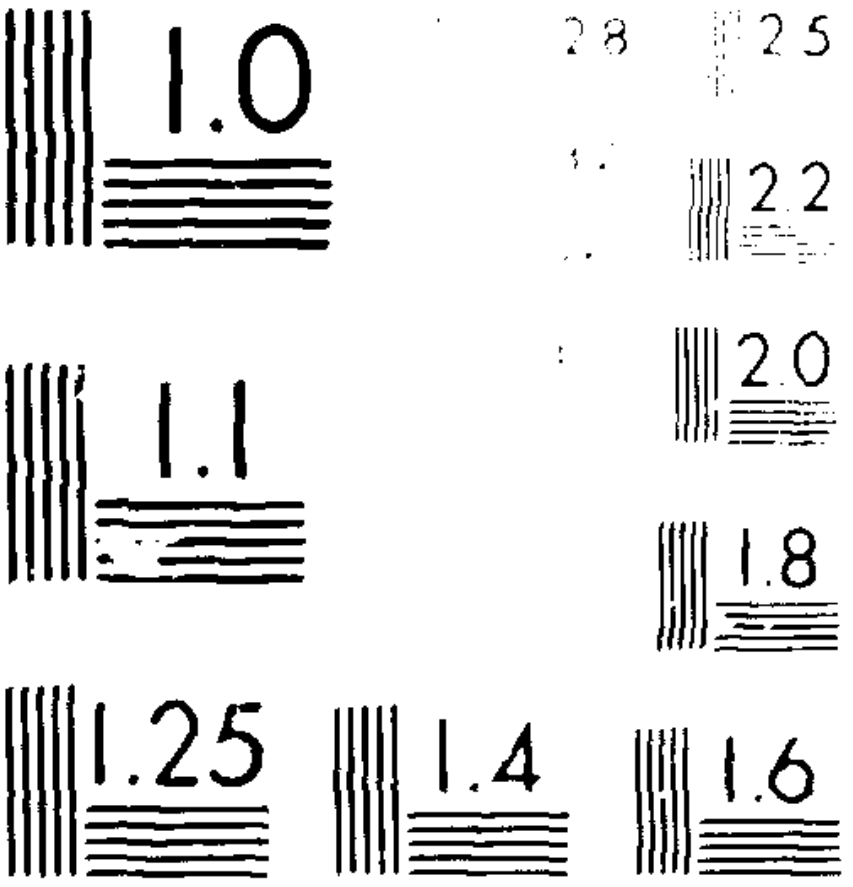
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India.

ESTABLISHMENT OF A NUMERICAL CONTROL CENTRE FOR THE METAL WORKING INDUSTRY CMTI, BANGALORE

DP/IND/73/014

INDIA

Terminal report*

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

Based on the work of Eric C. Carlson,
expert in numerical control production

United Nations Industrial Development Organization
Vienna

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I. OBJECTIVES

A. To aid in the preparation and selection of production operation sheets in regard to Numerical Control in manufacturing.

B. To aid in the selection and design of the various cutting tools, Jigs and Fixtures for use with Numerical Control.

C. To evaluate and make recommendations for the best applications and utilization of N/C with regard to current and future needs of CMTI and the Indian industry.

D. To provide training and general consulting services concerning Numerical Control and the related support services.

II. FINDINGS AND CONCLUSIONS

A. The staff at CMTI is well versed in the preparation and selection of production operation sheets. Although the formats are satisfactory there is still a need to modify them to allow their implementation with respect to computer based process controls in the future.

B. CMTI has an excellent group of engineers for the design and application of cutting tools, jigs and fixtures. There is still a need for more work in the newer areas of tools and fixtures, particularly in the areas of plastics (for bonding), adhesives, modular tooling and modular fixturing systems. In addition, the design of interchangeable tooling and the design and implementation of parts palletizing systems using available local materials and if necessary by importing certain materials, should be considered.

C. There is a need in India for low cost, simple N/C drilling and milling machines. Such machines would find many applications throughout the Indian metal cutting industry. This was based on a sampling of typical parts being produced, the majority of which require only straightline milling and other point to point operations. Other areas in which continued assistance is needed is the "non-chip" making or N/C support areas. Special attention is needed in the areas of material handling, facilities preparation to support N/C tool storage, tool handling, on-site parts storage and disposal of waste. More work needs to be done in these vital areas for successful N/C operation.

D. It is my opinion that the training programmes and materials in use at CMTI are quite comprehensive sometimes to the point of being too detailed for the job and course requirements. I feel that the courses and materials should be prepared with emphasis on specific areas of training. A general background of the total picture would be more appropriate than the advanced and highly technical courses and

materials covering broad areas of N/C. This may reduce the overall coverage of training for each person, but provide more specific and practical training.

III. RECOMMENDATIONS

A. Set up a working model, at CMTI, of Production Operation Control using computer data entry and retrieval formats for all operation sheets. This should be done for all the jobs, conventional or N/C. This would demonstrate the advantages of such a setup to the Indian industries, although the benefits would not be considerable to CMTI.

B. Set up a functional N/C tool room (not just for the specific requirements at the facilities at CMTI) for the purposes of using it as a model for all tool rooms in India.

1. Implement a system of tool storage and transportation utilizing universal tool cards, etc.

2. Implement a tool and fixture inventory coding system using the T.N.O. Group Technology coding system (or any other suitable coding system).

3. Set up a group to investigate the various modular tooling and fixturing systems for possible standardization. This would allow the sharing of tooling for different makes and ranges of machines and thereby reduce tooling costs (as well as total costs) for N/C machines in India

C. Investigate the use and application of standardized palletized manufacturing systems to permit the transfer of parts from machine to machine with minimum set-up time.

D. Investigate the retrofitting of various types of positioning systems for installation on conventional machine tools, particularly low cost mechanical positioning devices such as TRAVEL DIALS, Vernier scales, or Optical measuring systems.

E. Prepare a tooling encyclopedia for the use in tool room and programming departments. This should include drawings, specifications, etc. of all available tooling, fixtures and holders for use in selection for various jobs.

F. Establish a group to investigate the actual market for N/C machine tools in India with emphasis on the simpler and more economical machines. This would include retrofits for existing machines and the simple point to point systems for drilling and milling.

G. A system should be set up to allow the staff to visit and work with other institutions and companies abroad with regard to N/C training programmes. These individuals should perform some of the training as opposed to "sitting in a class".

H. Implement a programme of centre staff serving as consultants to industry. These individuals might also conduct seminars concerning economic justification and analysis relative to implementation of N/C.

I. Investigate the possibility of an arrangement, whereby the centre would contact tooling manufacturers and suppliers for samples of their N/C tooling for testing and demonstrating purposes. This would permit these companies to use the facilities at CMTI for customers. Through this, N/C Centre machines will get the much needed tooling for study, training and research, while allowing the companies to justify these donations by showing that their equipment is being demonstrated to potential customers.

IV. DISCUSSIONS

Though the duration was relatively short, quite a few discussions were held and suitable solutions or potential solutions were developed for some production problems as enumerated below.

A. Machining of Sprocket housings (with Mr. Raj Khanna)

1. Suppression of vibrations by providing additional, adjustable supports for the component.

2. Guidelines for tapping holes in which weldments are encountered.

3. Modification of boring tool for reducing vibrations.

B. N/C for small shops and retrofitting (Mr. Somasekhara Rao)

1. Application of point to point and straightcut machines.

2. Means for justification of N/C by picking sample parts and analysing them.

3. Need for development of a small, low cost N/C lathe with mill/drill capabilities.

4. Preparation of suitable manual for the above machine.

C. Guidelines for maintenance

1. The development of a interchangeable test plug for all controls for system diagnostics and maintenance was discussed with Mr. M.S. Srikantaiah and group.

D. Guidelines for consultancy in the area of component analysis and N/C selection (Mr. J. Thyagarajan)

1. Formats for collecting technological information

were worked out.

2. Guidelines for the preparation of justification studies were discussed.

E. Tool and material control (Mr. M. Nagaraju)

1. Economics of using carts for transporting tools, fixtures and parts was discussed.

2. Development of tool/fixture coding system based on Group Technology.

3. Application of palletizing systems in production shops.

F. Group discussions with staff

Three brief lectures were given to the machining services staff on:

(i) tooling in general

(ii) consultancy services

(iii) problems and possible solutions in different areas of N/C

(iv) trends in tool control and material handling systems

V. CONCLUSIONS

A. Though the duration was short I feel something useful has been accomplished.

B. I feel the mission of an expert could be more effective if a follow-up visit is made possible. The first visit lasting 2/3 months would familiarize the expert with the environment. During this time he can evaluate the needs and abilities of the staff. This would help him and the staff to prepare adequately for his follow-up visit which could be planned after a few months interval.