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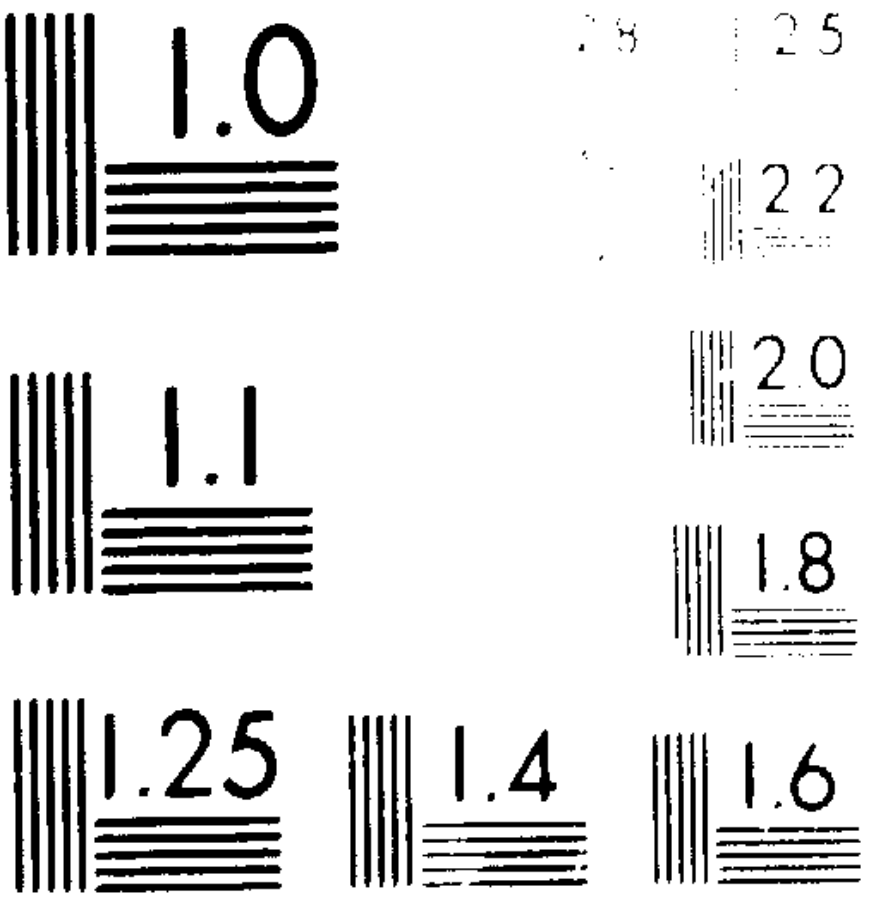
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org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United Nations Industrial Development Organisation

DP/IND/72/045
India.
Manufacture of Multi-Speed Hubs for Bicycles

Final Report

12054

1982

P-E International Operations Ltd
A member of the P-E Consulting Group

PE

P-E International Operations Ltd
A member of The P-E Consulting Group

Park House Egham
Surrey UK TW20 0HW
Telephone Egham (0784) 34411
Telex 933783
Telegrams Prodeng Egham

November 1982

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION
TRADE DEVELOPMENT AUTHORITY OF INDIA
ADVICE TO INDIAN BICYCLE MANUFACTURERS

DP/IND/72/045 - INDIA

MANUFACTURE OF MULTI-SPEED HUBS FOR BICYCLES

FINAL REPORT

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION
TRADE DEVELOPMENT AUTHORITY OF INDIA
ADVICE TO INDIAN BICYCLE MANUFACTURERS

DP/IND/72/045

INDIA

MANUFACTURE OF MULTI-SPEED HUBS FOR BICYCLES

FINAL REPORT

1. INTRODUCTION

Following the award of a UNIDO assignment to P-E International Operations Ltd., the consultant W N Stone was allocated to work for 3 months in India in conjunction with the Indian Trade Development authority. The terms of reference for the assignment were:

- to advise the Trade Development Authority's members on the development and manufacture of multi speed hubs for bicycles.

The consultants assignment began on his arrival at Delhi on 31 July 1982 and continued throughout August, September and October. The issue of this report concludes the work.

Preliminary visits to factories in the Delhi area, Ludhiana and Mysore, revealed that, at present, there is no manufacture of multi speed hubs in India although a factory has been set up in Mysore. Further, there exists in India all the detail drawings of the multi speed hubs made by European and Japanese manufacturers. There is therefore not a problem of knowing how to make hubs but rather one of not having the correct machinery as will be shown later in this report. The second major problem is that the international manufacturers are not prepared to enter into arrangements for licencing and subsequent re-purchase of hubs manufactured in India. P-E therefore advised UNIDO that the terms of reference could not be adhered to and they, in turn, contacted UNDP. During the 3 months he was in India, the consultant was not given any revised terms of reference, but by request from Trade Development Autnority and with the agreement of UNDP New Delhi, continued to advise cycle manufacturers on production problems that were observed during works visits. Manufacturers of cycle components and units in factories in Delhi, Faridabad, Ludhiana, Bombay, Mysore and Madras were visited.

2. BICYCLES IN WESTERN COUNTRIES AND INDIA

In India the bicycle must be cheap and of very rugged construction. There are no refinements such as lighting or multi speed gears and the construction is very heavy. Frequently, the bicycle is used to carry heavy loads, often two or even three people ride on one machine. This is in direct contrast to conditions say in Europe where lightweight bicycles are used, and accessories such as dynamo lighting, multi speed gears and hub brakes are commonplace whilst super lightweight sport cycles may be fitted with a variety of expensive gadgets to give a speed advantage.

The Companies visited during the consultant's assignment were all manufacturing for export and the products produced, therefore, were not those which would have any market in India.

3. MEETINGS OF SMALL INDUSTRIES MANUFACTURERS

During the first week of his assignment the consultant met manufacturers from the Delhi area and discussed various types of multi speed hubs and other hub mechanisms such as internal brakes and automatic gear changers. Later in the week he visited Ludhiana (in the Punjab) where a meeting of local manufacturers had been arranged by the Director of the Small Industries Service Institute. After introduction by the Director, the consultant addressed the meeting on the subject of multi speed hubs and a discussion followed. It soon became clear that those present were not only not interested in multi speed hubs but were positively against making them. It was considered that such hubs could not be produced economically in India. It was at this meeting that the consultant heard of the Speedmakers Multi Speed Hub Company at Mysore which had been set up to manufacture 3 and 5 speed hubs. The discussion showed that it was believed that the Mysore Company was in financial difficulty due to their attempts to get into the multi speed hub market.

4. MULTI SPEED HUB MANUFACTURE IN INDIA

Seven to ten years ago several Indian companies considered making multi speed hubs. One of these was the Indian Bicycle Corporation of Bombay; this Company was visited by the consultant who examined the work that had been done. It was proposed to set up and manufacture a three speed hub copied from that of the Shimano Company of Japan. Hubs had been dismantled and drawings made of the component parts. Examination by the consultant showed that many of the hub components had gear teeth or rachets and that these components had been made by the cold forging process. In this process, which is not available in India, such shapes as gear teeth can be produced finished. In fact, the only machining required on the cold forgings were such details as screw threads, cross drilling and grooves which would not "draw" from the forging dies.

The consultant was asked to prepare planning and method sheets for producing the Shimano hub from hot forgings, sheet, and bar by using conventional machining processes. It was not possible to do this; the Shimano 3 speed hub was specifically designed to exploit the cold forging technique and uses very light sections on the components and the minimum of machinery.

Because a cold forging plant would have to be imported and because of the very high capital cost involved, the project to manufacture multi speed hubs was abandoned until the short lived revival during the consultant's visit.

In 1976-78 a scheme was promoted, by a German factory, to make 200,000 bicycles per year in India, these were all to be exported. To provide 3 speed and 5 speed hubs for these, a new factory was set up in Mysore. This is "Speedmaker" Multi Speed Hubs Ltd.

Leading world makers of multi speed hub gears all employ techniques of manufacture whereby the laborious and expensive machinery or gearing is avoided. Shimano use cold forgings, as already discussed and Fichel and Sach (German) and Sturmey Archer (British) use sintered components which are formed by compacting and coining powder metals. The sintering process is available in India but not at a reasonable or economic cost so the promotors of Speedmaker Multi Speed Hubs decided to import German made machinery to make their own sintered components. Indian regulations did not allow the import of the special metal powder for sintering unless an export order for the product could be shown. Not having an export order, "Speedmaker" were unable to install the sintering process in their works when building. Instead, machinery was purchased for gear shaping, gear hobbing and other conventional machine tools to make the hub components from bar, sheet and hot forged blanks. Thus, a factory was built, equipped with outdated methods, to produce multi speed hubs in competition with established foreign companies using advanced methods. Whilst "Speedmaker" Hubs factory was being built, the German promotor died and the cycle building project collapsed. So today, a complete manufacturing plant exists able to produce 2000 or more multi speed hubs per week but without orders or prospects of obtaining any.

T I cycles of India, Madras, are now actively studying the possibility of making multi speed hubs and in September the consultant visited their works to discuss the project with them. Being part of the T I Group and thereby being associated with Sturmey Archer of England, they are in a unique position to manufacture multi speed hubs in India. Sturmey Archer will provide drawings, technical knowledge and if required such components that cannot, at present, be made in India. The estimates that had been prepared were examined by the consultant, but discussions showed that these should be revised when up to date drawings and information are obtained from Sturmey Archer. If the new feasibility studies to be done show that the project is viable in the long term, T I Madras could start in a small way, importing the sintered components from England, and build up to the complete manufacture in their own works.

In the consultants opinion, T I Cycles of India are the only company, visited during the assignment, who have any real prospect of making multi speed hubs in India.

5. OTHER PRODUCTION ENGINEERING WORK DONE DURING THE ASSIGNMENT

Following the initial visits to various works and the study of multi speed hub manufacture, Trade Development Authority arranged a further programme of works visits for the consultant. This was to study manufacturing problems in the production

of cycles, units and accessories. Works visited were engaged in the manufacturer of the following products:

- hubs
- chain wheels and cranks
- multi speed free wheels for chain type change speed gears
- wheel rims and spokes
- cycle frames.

The work undertaken by the consultant at the various works visited included:

- tracing the cause of manufacturing errors in the workshops
- correcting the cause of the errors and supervising the manufacture of trial batches of components to prove tooling and methods
- designing gauges and tooling equipment
- working with the companies production engineers in the detailed planning of methods of manufacture
- assisting in the layout of a machine shop for a new factory
- vetting proposals for the purchase of Japanese automatics and examination of machine tools of Indian manufacture required for increased production.

Presswork and machinery problems investigated revealed faults in methods and tooling such as incorrect clearance between punch and die and faulty clamping and unstable locating faces in jigs and fixtures. Many of the problems in machining were due to poor setting up and lack of gauging checks during manufacture. Most of the hub makers had concentricity problems but in every case the consultant was able to show that it was due to poorly maintained tooling, inaccurate setting up and lack of gauging during the manufacture of the detail parts.

Eccentricity was also a problem with some makers of multi speed freewheels. This was corrected by revised methods of holding components for turning operations and changing to copy turning and thread chasing.

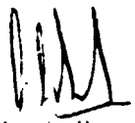
6. CONCLUSIONS

Three progress reports were issued during the consultant's assignment and finally a summary of the work done was prepared for Trade Development Authority. Report No 2 was issued with supplements so that the relevant portion of the report with included sketches and diagrams, could be sent to the company concerned.

Copies of reports numbers 1 and 2 are enclosed in Appendices 1 and 2 to this report. Unfortunately copies of report number 3 and the summary have not been returned to the consultants after typing by TDA. In Appendix 3 we enclose the letters from leading manufacturers in reply to our letters asking if they were prepared to cooperate with Indian companies.

The consultant is grateful for the cooperation and assistance received from management and personnel at all levels in the companies visited. He believes that useful practical work was done during the assignment, though the work in some respects was different from the original terms of reference.

Submitted for P-E International Operations Ltd
by



A M Marshall
Managing Director

PROGRESS REPORT NO 1

PRELIMINARY FINDINGS

INTRODUCTION

The consultant's assignment in India commenced on August 1 when he arrived in New Delhi. After introductory meetings at UNDP, Lodi Estate Offices and at the TDA Head Office, an initial programme of works visits was arranged. At TDA office meetings were held with Small Industries Division and some local manufacturers, and were concerned mainly with the manufacture of multi speed hubs.

Preliminary visits were made to works in the Delhi area, Ludhiana and Mysore and the consultant's observations from the first phase of the work are as set out in the following notes:

Wednesday August 4 United Wheels Sahibabad - Mr V Aggarwal

The machine shops of this organisation are equipped with copy turning and thread chasing of their own design and manufacture, to ensure dimensional accuracy. The methods used in the production of multi speed freewheels are very good. The consultant was requested to make another visit and review proposals for the purchase of automatics to be used for the increased turning capacity required.

Friday August 6 a Meeting of Local Manufacturers Arranged by Mr R K Arora, Director, Small Industries Service Institute, Ludhiana

After introductory remarks by Mr R K Arora, the consultant explained the purpose of his assignment and that he would make preliminary works visits in the area.

None of those at the meeting was interested in making multi speed hubs and the general view was that they could not be made competitively in India.

Friday 6 August Hero Cycles - Messrs U and R H Manial

The methods used in machining components for multi speed freewheels were by forming and turning which would not give the accurate sizing which would be achieved by using copy turning. There are problems with distortion in heat treatment. The factory has some very good special purpose machines designed and made in the works.

Friday 6 August Rockman Cycle Industries - Mr S Kant

The consultant was shown chain and hub making processes and afterwards asked about specified problems. He was able to to offer some suggestions.

Saturday 7 August Sadam Industries

The consultant was received by Mrs R Dhanda in the absence of her husband who was away on business. Mr Dhanda is interested in making multi speed hubs and would like the consultant to visit Ludhiana again to discuss this.

Monday/Wednesday 9 - 11 August "Speedmaker" Multi Speed Hubs Ltd, Mysore
Mr T K Nagaraj

This factory was set up to produce 2000 multi speed hubs per week but there are no orders for these and some of the plant is employed on other sub-contract work.

In 1976-1978 Mr Nagaraj was in association with a Mr Hinemann, a German Cycle maker who proposed to make 200,000 bicycles per year in India (all for export) Mr Nagaraj was to make 3 speed hubs and later 5 speed hubs for these cycles. Drawings were made and tools and methods designed. Plans were made in consultation with Mr Hinemann to build a factory and equip it to make hub change speed gears. These multi speed hubs were to be built from parts machined from bar, forgings or sheet.

In 1978, Mr Hinemann died suddenly, the bicycle making project collapsed also multi speed hubs prospects of a certain market for the product. A batch of 1000 speed hubs was started, the machined parts being made by sub-contractors who had the same machines it was intended to install in the new factory, being built. The works were completed and forging equipment, machine tools, heat treatment and plating plant installed. The factory was planned, at first, to make 2000 3 speed hubs per week but there were no buyers abroad and no market in India. In an effort to sell his product, Mr Nagaraj visited 4 factories in France, 2 in the USA and corresponded with a Finnish dealer and Shimano, Japan. No orders were received.

An order was obtained for 1000 sample bicycles tc be sent to the USA. These were to be fitted with "Speedmakers" hubs. Whilst the cycles were en route to the USA, a new regulation was enacted regarding bicycle frames. On arrival the shipment was rejected and returned to India.

Shimano, Sturmey Archers and Sach build multi speed hubs using some sintered components such as gears, startwheel, ratchets and plate. This reduces machining costs. Mr Nagaraj could have installed coining and impacting presses and associated sintering plant and reduce his machining costs by 50%. In 1977 such a plant would have cost Rs. 9,000,000. But, he was not allowed to import the special sintering powder unless it could be shown that the product would be exported. Enquiries at Indian sintered products manufacturers show that the required parts would cost much more than does the present machining method.

Despite more than ordinary efforts "Speedmaker" have not been able to obtain orders. Mr Nagaraj believes it is necessary to have a world known trade name and world wide servicing facilities.

The drawings plant and tooling installed at "Speedmakers" Mysore works have been examined by the consultant and in his opinion are adequate for the production of multi speed hubs in the qualities planned.

Future Programme of Works Visits

Requests have been received from other manufactures in the Cycle Trade and from some places previously visited and a programme of visits is now being arranged.

Norman Stone

INTRODUCTION

This report continues from Report No 1 issued on 17 August 1982 and details the consultant's activities from that date until the 17 September when report No 2 was drafted.

Advisory visits and discussions were held with manufacturers as arranged by the Trade Development Authority. These took place at works in Delhi area, Faridabad, Ludhiana, Bombay, Madras and Mysore, the consultant's findings were as follows:

1. Wednesday 18 August, United Wheels, Sahibabad

A second visit was made to the works and the consultant reviewed a feasibility study drawn up by United Wheels' Directors proposing the purchase of Japanese automatic lathes. These machines would be used for the more efficient production of components used on multi speed freewheels. The consultant agreed that the machines would provide faster and more consistently accurate production and recommended that they should be acquired.

2. Thursday 19 August, Freewheels (I) Ltd, Faridabad

This company had ceased production of multi-speed freewheels because of failures in service in Europe and because of excessive scrap being produced in the works.

The machines and methods that had been used in the manufacture of multi-speed, freewheels involved forming, turning and threadmilling processes. This would require repeated location of the components in chucks or on mandrels. In the consultant's opinion, such methods would lead to errors in squareness and concentricity and thus excessive scrap. It was recommended that new methods should be designed incorporating copy turning and thread chasing. The consultant would later be available to assist in the methods and tooling design work according to arrangements to be made between Freewheels (I) Ltd and TDA.

Failures of multispeed free wheels were caused by the breakage of pawls, due to minute cracks in the carbon steel bar used. A reliable bar is not available in India, it was, therefore, recommended that the material should be imported. All the multispeed freewheels are made for export.

3. Tuesday 24 - Friday 27 August - Sadem Industries, Ludhiana

Here, the consultant's time was divided between:

- locating and correcting sources of concentricity errors, in bicycle hub assemblies
- assisting in planning the layout for a new machine and assembly shop and marking the shop floor with positions for gang ways, machinery and plant.

The work done during this visit is described in detail in a separate report.

4. Monday 30 August - Saturday 4 September - India Bicycle Corporation

The company requested the consultant to prepare process planning and method sheets for the manufacture in the works of a Shimano (Japanese) 3-speed hub. Work unfinished when the consultant left at the weekend was to be completed by Mr Day, Production Manager, and sent to Delhi for vetting by the consultant.

This work is reviewed in a separate report.

5. Monday 6 and Tuesday 7 September, T I Cycles of India, Madras

Together with T I Cycles Management, the consultant reviewed various proposals for making Sturmey Archer multispeed hubs in Madras. The hubs would be made to Sturmey Archer drawings, specifications and to their approved standards. Other than this study, the consultant's time was spent locating the cause of errors in production methods used in bicycle frame, freewheel and hub manufacture.

A separate report reviews the consultant's work at T I Cycles, Madras.

6. Friday 10 and Saturday 11 September, 'Speedmaker' Multispeed Hubs Ltd - Mysore

On a previous visit to Speedmaker Multispeed hubs, the consultant was asked to contact T I Raleigh England to see if a project could be arranged for 'Speedmaker' to supply multispeed hubs to T I Raleigh's specification. P-E International Operations Ltd contacted T I Raleigh who replied that they would not consider such an arrangement since they are associated with T I Cycles of India. T I Cycles of India are now working on a project to manufacture Sturmey Archer hubs as discussed in paragraph 5. This information was given to Mr Nagaraj of 'Speedmaker' multispeed hubs, by the consultant.

The position at 'Speedmaker', Mysore, therefore, is that they still have no prospect of receiving orders for the manufacture of multispeed hubs.

CONCLUSIONS

The consultant's opinion is that of the various companies visited, T I Madras are the only ones with any real prospect of making multispeed hubs in India. This company's approach to the project is business like, realistic and thorough. Moreover, they are in association with a company who will supply drawings, know how, if required, and will supply such components that cannot at present be produced in India.

Of other projects than multispeed hubs, there is a continuing demand for the consultant's services to investigate and advise on production problems. Further visits are being arranged as requested.

PE

Extension to Report No 2, Paragraph 3 giving
technical details of the consultant's work at
Sadem Industries, Ludhiana

INTRODUCTION

The works at Ludhiana is engaged in the manufacture of cycle chain wheels, cranks and wheel hubs. They also make bearing pullers in several sizes. New workshops have been built at another site and machinery and equipment are in the process of being moved from the old premises.

Manufacturing equipment consists of hot forging plant presses, reduction spinning rolls and machine tools for cutting off, turning, milling and drilling operations. Plating and polishing plant is installed for finishing processes. Obtaining a good finish and appearance is very important for the cycle products made.

1. New Machinery

Together with Mr Dhanda, owner and Manager of Sadem Industries, the consultant examined some high output drilling equipment which it is intended to install for increased production of cycle cranks.

2. Errors in Cycle Hub Manufacture

Inspection of finished assembled hubs showed that they were eccentric on the axle, more than the allowed limits. Examination of the detail components and of tooling used in their manufacture, revealed errors. It was found that some of the cups, see figure A Appendix 1 were outside drawing tolerance. In order to make a trial batch of hubs, the cups were sorted and only cups within size tolerance were used. The supplier of the cups was interviewed and he complained that excessive punch wear was causing loss of tolerance. He was recommended to use a punch having a 'hard facing' welding deposit at the wearing end and to try and control distortion in heat treatment quenching by having all the cups lying in the same direction in the heat treatment basket.

The collet figure B Appendix 1 was found to be running out of true on the lathe and a new collet and peg were made.

Flanges, figure C Appendix 1, were found to be out of round and undersize. It was decided to incorporate an extra press operation in the process to iron the pressing to final size. Meanwhile, for try out purposes flanges were bored out to correct size. When these things were done, a trial set of hubs was produced and all were within the eccentricity limits allowed.

3. Workshop Layout

Following the investigation work on hubs, the consultant assisted Mr Dhanda in making a layout plan for the new workshop. From the plan, lines were drawn on the shop floor marking gangways and the boundary of different departments. Finally, the machine tools, but not the heavy presses, were moved to marked positions whilst the consultant was at the site.

Extension to Report No 2, Paragraph 4 giving
technical details of the consultant's work at
India Bicycle Corporation, Bombay

INTRODUCTON

The company makes bicycles and 7-10 years ago considered a project for reproducing the Shimano 3 speed hub in the works at Bombay.

Detailed component drawings were made from dismantled Shimano hubs but the drawings were unfinished and do not show fits and limits to be achieved. A key factor in the design of Shimano multispeed hubs is that cold forgings are used for many of the mechanical details, so that gear cutting is eliminated except for the main shaft. For the most part, components are cold forged finished or with little secondary machining operations to do. Normal presswork details are used in the construction and a few, mainly smaller components are machined from bar.

At the time when the proposal to make the 3 speed hub was considered, the very high cost of obtaining cold forgings, which are not presently available in India, made the project unviable.

When the consultant arrived at the works on Monday 30 August, the Shimano 3 speed hub project was revived. The consultant, with the assistance of India Bicycle Corporation's Chief Planning Engineer was asked to prepare method planning sheets suitable for producing the Shimano hub from conventional hot forgings, plate and bar by machining and presswork operations.

1. Examination of India Bicycle Corporations Press Shop and Machine Sh

The consultants examination of the workshops showed that normal chuck and bar autos, turret lathes and capstans, milling, drilling, broaching and tapping machines are used for machining. A variety of presses is installed and the work ranges from blank and piece, forming, bending, and coining operations.

2. Planning the Hub to make from Hot Forgings Machining and Presswork Operations

After working for one day on planning the Shimano hub for existing methods available, the consultant realised that it is quite impossible to do this. For example, in some components ratchet teeth would have to be cut on a gear shaper and to do this an undercut would be necessary. The components as designed are very thin walled and any undercut would seriously weaken the component. Undoubtedly, the Shimano hub is specifically designed to utilise the cold forging process.

3. Change of Plan

The consultant explained the difficulties to Mr Jain, Manager and Mr Dey, Planning Manager. Immediately, it was decided to use cold forgings on the project and the consultant was asked to proceed on this basis.

4. Planning for making the 3 Speed Hub as Designed by Shimano

The consultant decided that it would be quicker if he and the Chief Planning Engineer worked separately so the Chief Planner worked on the pressings and the consultant on the mechanical parts.

By the end of the week the consultant had completed planning on all the cold forged items and had commenced making out method sheets giving optimum feeds and speeds to be used. By this time it was Saturday afternoon and Mr Dey agreed to continue where the consultant left off.

5. Further Work to be Done on the Project

When Mr Dey has completed the method sheets and planned such components that were not done; all the planning work together with drawings are to be sent to Delhi for the consultant to vet.

Extension to Report No 2, Paragraph 5 giving
technical details of the consultant's work
at T I Cycles of India, Madras

INTRODUCTION

T I Cycles of India make bicycles which are shipped out in knock-down form - being part of the T I Group they are associated with Sturmey Archer, makers of multispeed hubs in the UK.

The consultant had extensive discussions with Mr H N Chandrasekhar, General Manager and Mr P Shanmughan, Technical Manager, on the manufacture of multispeed hubs and also discussed the chain type variable speed gears.

T I Cycles have made estimates for the cost of setting up to make Sturmey Archer 3 speed hubs by importing the know how, drawings and quality standards as used in the UK. At the first stage it would seem better to import the sintered parts from the UK, since sintered products are not available at a reasonable price in India. This would substantially reduce investment costs in new plant but the cost of making in new relatively small quantities of hubs at first, would be high. T I Cycles made estimates which showed investment levels and break even costs for three alternative types of production using part imported components or making complete in India. However, these estimates were prepared without complete drawings, material specifications and details of the fits and finishes required. It was agreed that complete drawings and specifications will be obtained from the UK and new estimates made.

After the discussions the remainder of the consultant's visit was spent in the workshops. Mr Shanmughan and his assistants had prepared a list of manufactuing problems which were examined. Details of the items examined and of possible solutions discussed are given in the Appendix to this report.

Finally, at a summing up meeting with Mr Chandrasekhar it was agreed that methods engineers should be allocated, each to a section of the works, to deal with production problems that occur. These methods engineers would have an intimate knowledge of the work in their particular section and would be available as specialists to deal with difficulties on the shop floor.

APPENDIX 3

SHIMANO (EUROPA) GmbH.
Prof.-Oehler-Str. 9
4000 Düsseldorf 13, W. Germany

Telefon: (0211) 793097-98
Telex: 8587249 segh d
Telegramm: SHIMANOEUROPA

Bankverbindungen in Düsseldorf:
The Fuji Bank Ltd. (BLZ 300 105 00) Konto Nr. 10 398
The Sumitomo Bank Ltd. (BLZ 301 103 00) Konto Nr. 0141 051 055
The Bank of Tokyo (BLZ 301 107 00) Konto Nr. 3 015 677
The Sanwa Bank Ltd. (BLZ 301 307 00) Konto Nr. 000 013

P-E International Operations Ltd.
Park House Egham
Surrey TW20 OHW
England

For the attention of Mr.A.Marshall

Düsseldorf, 11th August 1982
OT/ck

Dear Sir,

Thank you very much for your invitation and proposal for Venture business in India to produce the multi-speed hubs.

At this moment we are very busy to project our own production and we regret to say that we not in position to collaborate with your firm.

Thank you again for your interest.

Sincerely yours,
Shimano(Europa)GmbH

Osamu Takaoka
General Manager

TI Raleigh (International) Limited

Lenton Boulevard
Nottingham NG7 2DD
England

Telephone (0602) 787761
Telex 37681 (Ralind Nottingham)
Telegrams Ralind Nottingham

12th August 1982

Mr. Alan Marshall
Managing Director
P-E International Operations Ltd
Park House
Egham
Surrey
TW20 OHW

17 AUG 1982

Dear Mr. Marshall,

Mr. Boughton has passed to me your letter of 21st July, with its contents, in which you enquire as to our interest in collaborating with your client for the manufacture of multi speed hubs in India.

Our agreements with our associate company in India, TI Cycles of India, do not permit us to consider such an arrangement, and I should perhaps also mention that they have a similar project in train. With their strength in the product segment which utilises this gear, it may be advisable for your clients to rethink the viability of their proposal.

Yours sincerely,

R.A.L. Roberts
Managing Director

ERICH KRONAUER
VORSTANDSMITGLIED DER
FICHTEL & SACHS AG

8720 SCHWEINFURT
TELEFON (09721) 98 22 19

19. August 1982

P-E International Operations Ltd.
Mr. Alan Marshall
Managing Director

Park House Egham

Surrey UK TW20 OHW

Dear Sir,

thank you very much for your letter of Juli 21st 1982 containing your offer to collaborate with one of your clients in India in the manufacture of multi-speed hubs for bicycles.

Unfortunately we see no possibility to negotiate a licencing arrangement if the condition of compensation is part of this contract. Our licence policy is based on principles which exclude obligations of buying back products manufactured by licencee.

Hoping on your understanding we remain

yours faithfully