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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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ASSISTANCE IN SILK PRINTING AND DYEING

SI/CPR/84/802

PEOPLE'S REPUBLIC OF CHINA

Technical report: Technical advice in improving quality of silk fabric *

Prepared by the Government of the People's Republic of China
by the United Nations Industrial Development Organzation,
acting as executing agency for the United Nations Development Programme

Based on the work of Raymond Hofstetter, expert
in natural silk printing and finishing

United Nations Industrial Development Organization
Vienna

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Final Report on SI/CPR/84/802/11-01/31. 7. B / 15. 4. - 10. 5. 86

Visit to China from 15th April to 10th May 1986

1. Summary

1.1 General

- Main objectives of job description achieved. Time as mentioned before rather short for such a mission.

  Days were unequally shared between Suzhou (9 1/2 days), Hangzhou (4 days) and Shanghai (5 1/2 days), so the latter two Corporations could not be analyzed as deep as I would have preferred.

- Objectives of mission were not entirely clear to Corporations and mills. They did expect a follow-up of my last trip (October 85 for SANDOZ). They expected trials and demonstrations.

- After I have given clear objectives of my mission, assistance given was generally good. But in many cases I had to express my wishes to achieve goals in an imperative form. Without having had many years of experience with Chinese mills it would have been impossible to fulfill objectives of mission.

- Final conclusions and actions to be taken were presented 9th of May (afternoon) to technical head of China National Silk Corporation at Beijing.

  Also each mill was given a general statement; each Corporation a whole-day's lecture.

- In addition to the duties of my Job Description, my opinion on the draft prodoc CPR/85/024 were requested by ICETE. A meeting was arranged at the UNDP office on 9 May. Two senior technical staff from the Suzhou Silk Research Institute participated in the meeting. For further details, refer to para 2.2.

1.2 Activities

- 9 mills were analyzed and also given ideas for 2 new mills. Main subjects were degumming, dyeing, printing (incl. engraving), finishing, laboratories maintenance plant, power section, effluent treatment and education system.

- Dyeing tests were made in 1 mill (reactive dyes for discharge print by Rongalite C).

- Printing trials and demonstration at 3 mills (discharge and resist printing, engraving, thickeners, faster dyestuffs).

- Check of quality and regularity in 3 degumming mills, also tests of water hardness.

- Full-day's lecture given at 3 factories for all other mills of the 3 local silk corporation (Suzhou, Hangzhou, Shanghai).

  Content of lecture

  Modern machinery and processing for degumming, dyeing, engraving, printing and finishing, in addition the results of trials, conclusions and recommendations for the specific operations each mill was given.

- At Shanghai Silk Ind. Corp. additional half-day's lecture for top technicians (topic on modern machines and processing for silk).

1.3 Main results of mission

- Education level on traditional and modern technologies in respect to achieve higher quality standard rather low, this included:

  - Technical directors of mills

  - Responsible staff for production

- In many cases the necessary equipment and machinery is not adequate or not available. Also machinery was bought and imported which cannot be used for better processing of silk.

  Some mills have ordered new important machines mainly for finishing silk. After installation there could be an improvement, but I also was asked what for exactly these machines may be best used and how they must be operated.

- Lack of clear definition: What is meant under "higher quality level"? Clear figures for goal to achieve in many cases not available. Contradiction between offices controlling mills in respect of efficiency and technical responsibility in the mill for higher quality. Better and higher quality costs more, e.g. less shrinkage, better fastnesses, the mill reports they are not getting more money for better effects, they are rather blamed for higher costs.

- The general standard of quality in silk processing is for:

  - Degumming: Medium to good

  - Dyeing: Medium

  - Printing: Medium

  - Finishing: Medium to low

- There is a strong competition between different Corporations and in the same corproations among the mills. In one way this is good and stimulates results of the factory, but with a structure of a national organization (and also costly) some important items should be exchanged and given to all. So money for correct investments (hard currency) for machines and products can be spent more efficiently and slo time and money can be saved for costly unnecessary processing experiments.

- Many different lines (offices of local provincial government and silk corporation) are looking for foreign experts to come to China. They do not realize that silk processing in Europe and Japan is only a very small item and there are only very few experts in this or months of staying all their problems and do not realize that machinery and processing material are not adequate for better quality. The best pilot cannot take off his plane if conditions on the ground are not perfect.

1.4 Conclusions and actions to be taken
(were presented on flipchart paper at final discussion at Beijing, model included in this report)

- Education for executive directors and responsible technical staff is very important. This can be done partly on local facilities through experts, in Europe, Japan, mainly at suppliers' laboratories, since it is very difficult to enter in mills (except joint venture mills in Europe).

- A national education center for the silk industry is important.

- Clear instructions to competent staff for buying machines. Machineries abroad should only be ordered after a complete answer to a checklist, otherwise they will have soon a "museum" of machinery and equipment which is not adequate for silk processing.

- Clear definition of quality standards which China wants to achieve (data and figures). We must realize that a part of European high-fashion silk fabrics are not fast, but very beautiful and accepted by "couturiers" and their customers. China must realize that this market is not a symbol for wearing properties of silk. Also other European silk producers had to accept this and they are looking and finding their own way to give their fabrics a special standard of quality. This happens e.g. in Switzerland for dyeing and in Italy for printing.

- According to their standard of quality even adequate machinery must be available and also adequate processing technologies must be introduced.

- For strenthening the central function of National Silk Corporationé in Beijing a technical auditing (monitoring) of all mills under its control should be organized as soon as possible. 3 - 4 experienced people (one of the members should be the future responsible for the national center of education and developing) should visit in a period of 1 1/2 - 2 years all silk degumming, dyeing, printing and finishing mills. All available machines, all used processing technologies and the achieved standard of quality should be examined and with the results of this analysis, the head of the silk corporation would have a clear picture of the situation of the silk industries. This would help and enable to guide corporations and mills in respect of investments and processing.

2. Detail report

2.1 Objectives of job description and actions taken

2.1.1 Develop a work programme in collaboration with officials from the China Silk Corp.

Actions

Following priorities of the working programme were fixed:

1. Analyze/survey of mills.
2. Trials and demonstrations if there is time available.

The Silk Corp. at Beijing was under the impression the expert would stay 1 full month to their disposition. After having given UNIDO's regulation for 1 month (minus 4 travelling days, minus 2 days of briefing at Vienna) they had to change in the last moment the forecast schedule. They decided to give most time to Suzhou (9 1/2 days), then to split the rest between Hangzhou (4 days) and Shanghai (5 1/2 days).

2.1.2 Carry out a survey of representative silk reeling, dyeing, printing and finishing mills.

Actions

Following mills were analyzed (those with * enough time available):

- * Suzhou Silk Printing Mill

  Production 14 mio m per year, 20 % silk.

  Activities are degumming, dyeing, printing and finishing of silk.

  Some problems in degumming (hard water) and also in dyeing (friction marks). The printing department has been modernized with Swiss, Italian and Spanish machinery. The quality printed is medium. Very fine designs cannot be obtained either in flat or rotary print. They have problems to adapt the new thickener for better penetration. In the finishing department new machines will arrive. For the time being the quality of the finished fabric is medium to low.

  Despite this standard of quality the mill could get a good share of export orders.

- * Suzhou Degumming & Dyeing Mill No. 1

  Production 38 mio m per year, 20 900 000 m silk degummed for export, 5 700 000 m silk degummed and dyed in the mill. The mill was built about 2 years ago.

  Quality of degumming medium to good (water is treated on a softening plant).

  Besides the classical package degumming system they also use the continuous MEZZERA machine.

Dyeing

Medium to good. Some problems with friction marks. They expect to overcome those problems with the new recently ordered Italian dyeing machines. MEZZERA promised the machines with new modifications should be o. k. By our information this has not been proved in Italy so far.

Finishing

Quality medium to low. They bought new machines which should be available end of this year to improve the standard.

- * Suzhou Silk Degumming & Dyeing Mill No. 2

This is a very old mill which should be reconstructed within the next 3 years.

Production: The capacity is about 30 mio m per year, they have only produced 20 mio m in 1985. Silk production was 3 mio m. For 1986 they expect 4 - 5 mio m. 2 1/2 mio m are white for export and also partly local consumers. 0.5 mio m are dyed in the mill.

Degumming

Quality medium to good (soft water by treatment plant).

Dyeing

Quality medium. They are going to improve with new machines bought (Stars).

Finishing

Quality medium to low, but they are soon going to operate new machines which should bring up the quality standard.

- Li Hua Silk Printing Mill

(Not visited, only discussed). New mill about 30 km out of Suzhou, joint venture with the famous Italian mill "La Seta", Mantero/ Como.

A delegation came just back from Como, where a part of machines were bought together with the joint venture partner "La Seta". Other machines were not ordered and the mill manager wanted my opinion and discussed the layout of the factory.

This mill is going to degum, dye, print and finish silk.

- * Hangzhou Silk Dyeing & Printing Mill

Production 12 mio m, silk 3 mio m.

Activity of the mill is degumming, dyeing, printing and finishing.

Degumming

Quality medium to good. Some friction marks. Water quality is good, no treatment necessary.

Dyeing

Quality medium to good, some friction marks. They have invested 1981 in Italian overflow machines which are not suitable for silk. A modern KUESTERS pad mangle is available. They should investigate cold Pad Batch dyeing.

Printing

Quality medium. They should investigate in finer screen engraving for flat and rotary print. They also have problems to change over to thickeners with better penetration on their table printing system. They also should take benefit of the new BUSER printing machine which was introduced about 1 year ago.

Finishing

Quality medium to low. Should be improved with the new machines arriving.

- Hangzhou Silk Scouring & Dyeing Mill

Production 42 mio m per year, silk 14 mio m and silk mixed with viscose also 14 mio m.

Activities of the mill: Degumming, dyeing and finishing.

Degumming

Medium to good (enzyme and classical method).

Dyeing

Medium to good. Some friction marks. They cannot use the Italian overflow machine for silk dyeing.

Finishing

Quality medium to low. They have no special finishing machines, they should investigate if their calander (KUESTERS) could not be used for certain finishing operations.

- Dongfeng Silk Printing & Dyeing Mill, Hangzhou

Production out of 4.6 mio m per year, only about 10 % pure silk.

Activities are degumming, dyeing, printing and finishing silk.

Degumming

Quality medium to good.

Dyeing

Medium to good, some friction marks.

Printing

Quality medium, need better accurate repeat system on tables and also penetration for print paste.

Finishing

Quality medium to low. Besides the traditional Chinese finishing machine no special silk finishing equipment available.

- Shanghai No. 1 Silk Printing & Dyeing Factory

(Due to shortage of time not all departments of the mill could be visited).

Production out of 12 mio m per year, 1 mio m silk.

Activities of the mill: No degumming (material comes from mill No. 1 degumming and dyeing), dyeing, printing and finishing.

Dyeing

Quality medium to good, some friction marks.

Printing

Medium to good. Have modern printing equipment. Should improve engraving of rotary screens to get finer effects.

Finishing

Department not visited. Some fabrics seen. Quality medium.

- * Shanghai No. 1 Silk Degumming & Dyeing Mill

Factory over 60 years old, should be rebuilt within the next 5 years.

Production 21 mio m silk, 2/3 dyed, 1/3 only degummed (partly for export and also for local dyeing and printing mills).

Activities of the mill: Degumming, dyeing and finishing.

Degumming

Quality medium to good. Heavy fabrics tendency to friction marks. Also complaints from export, the degummed silk goods are yellowishing on storage, so they have to treat them again in Europe (better bleaching necessary).

Dyeing

Quality medium to good, friction marks on different fabrics. They also should look in the cold Pad-Batch method (Smith padder available; for tests o. k., but for production room is too narrow between stenter and wall).

Finishing

Quality medium to low. Should improve when they get the new ordered machine.

- * Shanghai No. 7 Silk Printing Mill

(Also named the "Three Golden Cup Printing Mill")

This mill is a typical example for old glorious days relaxing on the actual success. This mill is far behind with modern equipment to maintain the leading role. Local mills and also those from other Corporations are bypassing the standard of this renown factory.

The mill should be rebuilt within the next 3 years and should pick up as soon as possible modernization for not loosing ground.

Production 3 mio m silk (80 %)

Activities: No degumming, dyeing, printing and finishing

Dyeing

Quality medium, friction marks

Printing

Quality medium, not able to print very fine accurate designs, no penetration.

Finishing

Quality medium to low. They do not have the adequate machinery and for the time being no new machines have been ordered so far.

2.1.3 Advise on ways of improving dyeing and printing technologies in selected factories.

Actions

Advise of improving dyeing

We have in all mills the same problem: Mainly friction marks in dyeing, partly this fault starts already in the degumming where also sensitive fabrics are subject of too strong mechanical treatment. This fault has been known from the silk processing industry for years and for the time being there is only one solution to degum and dye so sensitive fabrics on Star. In dyeing in some cases cold Pad-Batch or also beam dyeing machines can assist. In very few mills they have realized this and they are going to buy Stars. The newer type of dyeing machinery named "jet", but mainly overflow systems are for the time being in many cases not satisfactory. The best overflow system is for the time being not better than the best winch.

Advise for printing

Here we have three main items which should be improved:

a) Engraving

In flat and rotary engraving efforts should be made to achieve much finer lines, e. g. on flat screens selecting the right mesh and engraving process on rotary selecting the new generation of "Penta" screens from STORK.

b) Penetration

In table printing they are used to work with starch. This thickener is easy handled in printing, but shows many disadvantages which are well-known by Chinese (penetration, washing time, temperature). Changing thickener can be compared to an earthquake in a mill. Nevertheless, it can be done and systematic tests did demonstrate the behaviour of two thickeners under the same conditions.

c) Problems with Rongalite C or Decroline discharge printing pastes

The critical items have been discussed and demonstration gave input for successful follow-up.

2.1.4 Advise on the introduction of modern process equipment and demonstrate modern printing pastes, chemical agents and dyestuffs.

Actions

a) Modern process equipment

The repeat system on the handprinting table is not any more up to date. They cannot continue to assist with a hammer the rosted device when on the other side competitors are using the most modern electronic repeat systems. A part of modernization programme is on the way, but in many mills decisions have to be taken which degree of accuracy and mechanization is most adequate for future quality level.

b) Modern printing pastes (based on guars) were demonstrated and the importance of measuring viscosity has been pointed out (there are not adequate viscosimeters available).

c) Chemical agents and dyestuffs

This has been discussed and demonstrated. The selection depends on the quality level the Corporations or the export bureau are going to fix.

2.1.5 Give lectures on the application of modern technologies in dyeing and printing silk fabrics with particular reference to:

a) Quality control requirements for dyed and printed fabrics

Actions

The trend of higher quality in some European mills has been discussed and also control requirements were mentioned. They normally are controlled by ISO norms. If there should be in the future a request for machine washable silk, the different processing steps should be controlled also by means of a scanning electronic microscope.

b) Shrink proofing in silk printing and dyeing

Actions

The method by marking a piece of silk and measuring before and after washing is known by the Chinese. The problem of shrink proofing is a general one and before the export bureau has not given clear instructions to the mill what they allow and what they are willing to pay for, there is no use to discuss this item.

Unfortunately, there is a draw-back. We have given already 35 years ago good shrink proofing results for silk. Nowadays they overstretch the fabric to get more meters. This tendency does not help at all silk and if there will be no change in very short time, many customers will not buy any more such a fabric.

c) The application of low temperature dyeing technology for silk

Actions

A part of dyeing can be done by cold Pad-Batch method, mainly by means of reactive dyes, but also for medium and pale shades acid or premet dyes are suitable (see recommendation of dyestuff maker).

Lowering the temperature of the classical dyeing method.
It has been pointed out that silk has a very high affinity and does not need dyeing temperatures over 80°C. In many cases 70 - 80°C are o. k. Medium and pale shades can even be dyed at 60 and sometimes even at 50°C. Also reactive dyes by exhaust method can be dyed at 60 - 70°C. There is no general rule, depending the fabric, depth of shade and the fastness required selected dyes allow deeper dyeing temperature than used so far (indication by dyestuff makers).

Quality norms and standards used internationally for silk products

Actions

The mentioned items are under strong discussion in Europe. Some traditional silk finishers still believe silk must not be fast and dry-cleaning is good enough. Other finishers realize silk should offer better performance in future and different mills have already started to set up her own standard for quality. For plain dyeing hand-homewash at 40°C is estimated to fulfil requirements of the market.

For printing some Italian finishers are launching machine washable silk, also minimum at 40°C.

As far as all normal fastnesses are concerned, e. g. water, washing, perspiration and light, the ISO norms are used. For machine washable silk so far there is no adequate testing method available. Only friction marks after different washing cycles are giving some indications.

2.1.6 Work out an adaptable concept for wet processing silk fabrics

Action

All wet processing has to be done under minimum friction, minimum time and minimum temperature. This starts by degumming, goes over dyeing to washing after printing.

According to the fabric, the right machinery must be available and the right methods of processing must also be applied. This has been pointed out clearly during the lectures.

2.1.7 Identify other areas for which further technical assistance is needed.

Actions

I have pointed out before the level of finishing is medium to low. So far, a great part of silk fabrics were not really finished. This concerns mainly all "crêpe" type fabrics. They are overstretched and flat. Also the handle is sometimes not very good.

A great part of the lecture was shared on explanation of mechanism and function of finishing equipments (special flipchart which was copied by Corporations).

2.1.8 Advise on a development programme for the Chinese silk processing industry.

Actions

a) Degumming

Evaluation for the best degumming system for Star, traditional method and continuous machine by means of soap synth. products or enzyme for different types of fabrics.

b) Dyeing

Investigation in the different dyeing methods with minimum friction, e. g. Star, beam, cold Pad-Batch.

Also lower temperature dyeing by correct pH control, temperature raising and levelling chemicals.

c) Engraving for printing

Finer designs for flat and rotary screens, also better accuracy.

c) Printing

- Better repeat system, higher accuracy in printing fine designs.
- Better penetration/change of thickener.
- Develop discharge and resist technologies (e. g. Rongalite C/ Decroline, Thiotan WS).

e) Finishing

- Decision for wash & wear silk either through chemical finishing or chemical modification of the fibre.
- General higher finishing standard for "crêpe" (more relief, not so flat; better handle, shrinkage).
- Give clear instructions as far as shrinkage allowance is concerned and invest in right machinery.

f) Elaborate minimum fastness figures for dyeing and printing, e. g. washing, water, perspiration and light fastness.

2.1.9 Prepare a concept of technical assistance programme for the Chinese silk processing industry.

Actions

When clear objectives are given for development programme mentioned under 2.1.8, a technical assistance programme can be elaborated. This includes visit of Chinese delegates to Europe (mainly to suppliers, because longer mill visits are difficult to arrange) and also visits and demonstrations from suppliers (European, Japanese). Ideal would be a national education and development center. Experts including suppliers could demonstrate new processing technologies in front of delegates of different mills.

Also the Technical Management of National Silk Corp. in Beijing should be able to give in future better assistance to the different Corporations and mills as far as investment of new machinery and processing technologies is concerned. To achieve this goal, a technical auditing (monitoring) group of 3 - 4 well-prepared and experienced people should visit and analyze all important silk processing mills. Ideal would be if the technical responsible director of the planned national education center would be member of this group. The undersigned has experience in this kind of auditing and would elaborate a programme and prepare and guide the group members for this delicate mission.

Under part No. 3 of this report tables and extracts of flipcharts presented to the Corporations during lecture and discussions are attached.

2.2 Report on CPR/85/024/Technical Development in Silk Dyeing and Printing

- On 27th April, I was invited to visit in Suzhou this center (received by Mr. Kong Da-De and Mr. Chou Lu-Ke, both directors of Suzhou Silk Research Institute and latter project leader). Unfortunately, the mill was not working this day (Sunday) and besides a discussion a short mill visit was organized. The general impression was, as far as modern machinery is concerned, not very good. Also processing technologies were not up to date. The same picture like in other mills, basic education for modern technologies and processing is not up to date. Some mills have better and more modern equipment compared to the Institute.
- At 9th of May, I was invited to give my comments at the office of UNDP at Beijing. Arriving late the evening before, I was asked to present my suggestions for above project.

  Mr. ZHOU XIAO MING, Deputy Division Chief of the China International Center for Economic and Technical Exchanges, Ministery of Foreign Economic Relations and Trade, was present, together with two Gentlemen from Suzhou Silk Research Institute. I made it clear, they need bitterly an education and later a developing center for all silk Corporations. The actual planning is unrealistic and I would agree to make it work after having received clear objectives. Before we can develop we must educate. (See also my Telex to Mr. ZHOU XIAO MING).

NOTE: See page 13 under 2.2.

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THIS IS SANDOZ COLOURS HONGKONG
12/5/86

ATTN : MR. ZHOU XIAO-MING

REFER TO OUR DISCUSSION AT UNDP ON 9TH MAY, YR COUNTRY NEEDS BITTERLY FOR SILK SUCH A CENTRE, YOU MAY START FIRST ON PROVINCIONAL BASE AND EXTEND IT NATIONWISE LATER. WOULD AGREE TO MAKE A REALISTIC PLANNING AND TO MAKE IT WORK WHEN CLEAR OBJECTIVES ARE GIVEN. SO CPR/ 85/024 COULD BE APPROVED.

THANK YOU.

REGARDS,
RAYMOND HOFSTETTER

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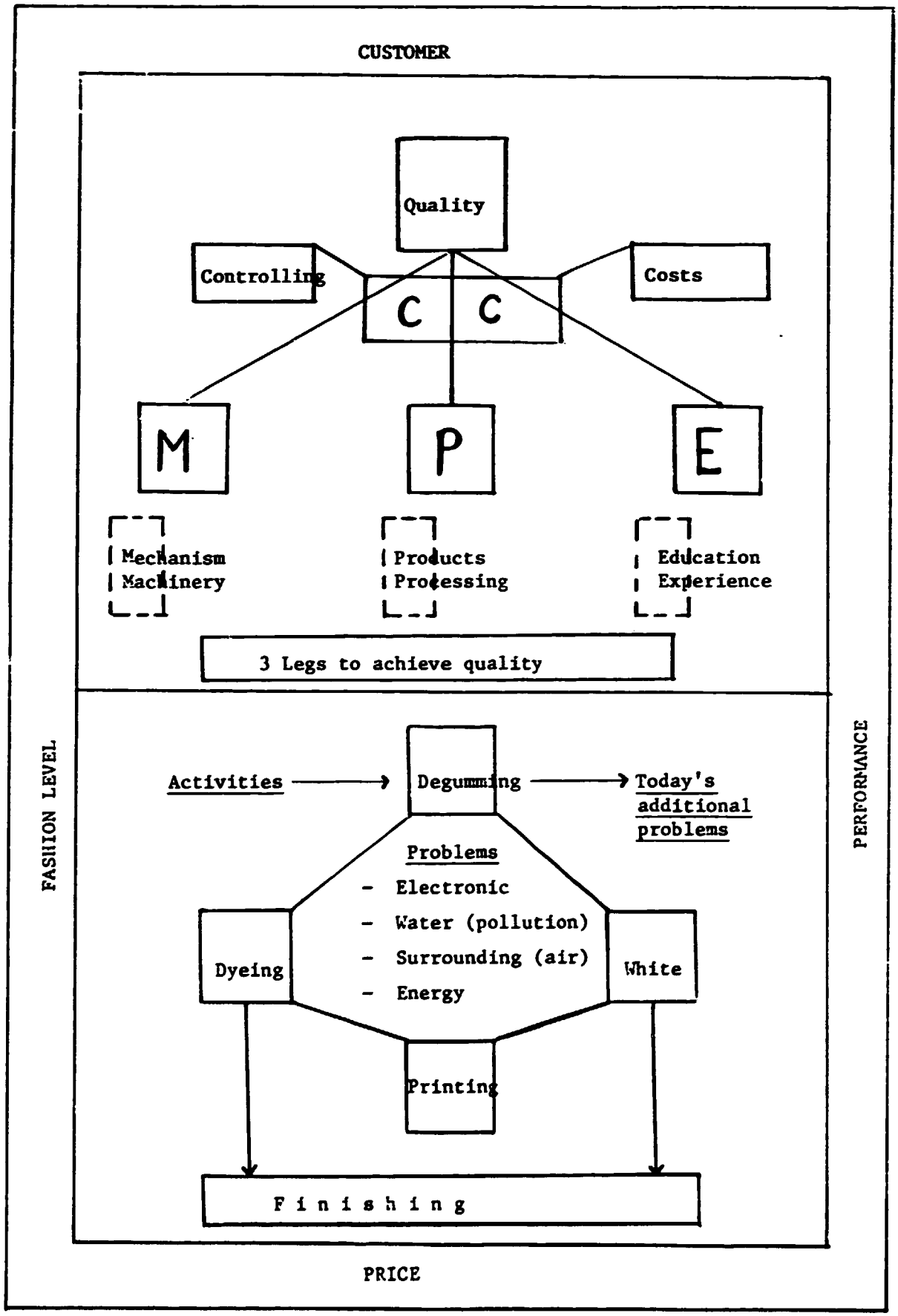
RH/JY

PRESENTATION OF ACTIVITIES OF
CHINA SILK CORPORATION



FOR CHINA NATIONAL SILK CORPORATION

Base of Problem	Problem	Proposals for Actions to be taken	Date	Priority
Information for head of Corporation (Beijing)	Yet not enough transparency at each mill for guiding Corporations and factories as far as future decisions are concerned for: - Investment of Machinery - Processing/Products - Quality standart - Efficeny/costs	Technical Auditing (Monitor) team of 3 - 4 well prepared and experienced people, going to each mill for 2 - 4 days. (training and program R. Hofstetter)	Start end 86 Results end 87	II
Investment Machinery	Corpoations and mills are byeing not always suitable machines for processing	- Stop byeing machines not seen operating and results on fabrics which are forseen for processing - Byeing "Prototype" should not be allowed (also promised modifications are equal to Prototyp) - Establish check List, only when fulfiled order allowed	Immediate July 86	I

FOR CHINA NATIONAL SILK CORPORATION

Base of Problem	Problem	Proposals for actions to be taken	Date	Priority
Education	not enough technical know how on modern processing methods and products for silk . Technical management of mills . Technical staff responsible for processing	- Delegate groups of 3 - 5 peoples to europen (japonese) suppliers for education on - Dyeing - Engraving - Printing - Finishing - Create national education centre	III Quater of 1986 Decision 86	I
Standart for quality	dear definition of quality level which must be achieved in future not given for - dyeing - printing - finishing as far as fastness figures and minimum performace are concerned	Each Corporation should work out together with China Silk Corp. at Beijing goals for standart of quality, create eventually a trade mark for chinese silk for - dyed - printed fabrics.	End of 1986	II

FOR NATIONAL SILK CORPORATION

Base of Problem	Problem	Proposal	Date	Priority
Quality of Degumming	Many europen dyers and printers are complaining quality of degummed silk coming from CHINA - Some residues left - friction marks - white not good enough	- Since many mills are exporting degummed fabrics it is very difficult to point out weak points in each mill. - more attention should be given to sensitiv fabrics (STAR, method with less friction, later eventually continous degumming) - better bleaching (by oxydation method and not only reduction bleaching)	87/88	II

FOR CORPORATIONS AND MILLS

Base of Problem	Problem	Proposals for actions to be taken	Date	Priority
friction marks	on degumming and dyeing Process different types of silk fabrics are sensitive to mechanical damage (friction marks)	- denote the sensitive fabrics at each mill and elaborate working conditions for - degumming e.g. STAR, Continous machines/Chemicals - dyeing e.g. STAR, BEAM, PAD BATCH/ Dyeing conditions	1986/ 1987	I
		- Event. decision for investment of machinery is necessary	End 1987	II
Dyeing temperature	to dye at lower temperature as usual (minimum 80°C and more) has been objetive at most of the mills. So for very little progress can be noted. Advantages are - less energy - less friction marks	because there is no general rule, (class of dyestuffs, dephts of shade are involved) suppliers should be contacted e.g. Acid dyes between 60 - 80°C Reactive dyes cold pad batch		II

FOR CORPORATIONS AND MILLS

Base of Problem	Problem	Proposals for actions to be taken	Date	Priority
Engraving for Printing	Results of engraved screens are not up to date as far as very fine lines are concerned for - flat screens - rotary screens	training courses in Europe - for flat screens, e.g. Zürcher Beuteltuch Fabrik (Zürich) - for rotary at Stork for Penta Screens or	1987	II
		invite delegates to demonstrate locally, but engraving facilities must be up to date.	1986/ 1987	II
Accuracy at "Printing on tables"	Fine designs and small forms can not be printed by the very old repeat system according to todays standart. This includes - hand printing tables - local made printing carriages	Decisions for - semi auto carriages [1] - auto carriages [2] - electronic carriages [3] 1 + 2 Precision good 1 interesting for China (minimum reduction of worker) 3 highest accuracy, for special disigns (1-2 carriages per mill)	1987 1987 1988	II

FOR CORPORATIONS AND MILLS

Base of Problem	Problem	Proposals for actions to be taken	Date	Priority
Penetration in Printing	- All mills are using Starch-thickener when hand printing on tables, penetration of printed colours is bad. In many cases the market requiers good penetration. Since the whole printing system and experiences are based on starch, changing can be compared with earth quake. Manager and workers are confronting problems - Some expierence has been already gained on mechanised table and machine printing. - the costs will be higher, at least double, because colour yield drops to about half and thickeners must be imported	- basic internal training courses for manager and workers (See also the basic demonstration of R. Hofstetter at each Corporation with 2 different screen mesh, 3 different squegees) - when technicans are in Europe for training also 2 - 3 days at thickener manufacturer, e.g. Polygal in Switzerland. - invitation of expierenced technicians of thickener manufacturers - mills should be compensated for higher costs when delivering better penetration	1986/ 1987 1986/ 1987 1987	I II III

FOR CORPORATIONS AND MILLS

Base of Problem	Problem	Proposals for actions to be taken	Date	Priority
Quality of Finishing	- due to Lack of appropriate machinery and experience the quality of finished silk fabrics must be considered as medium to low, this is especially the case for crèpe fabrics	- consult List of appropriate finishing machines given at lecture	1986	I
		- definition of shrinkage to achieve for crèpe fabrics	1986	I
		- education, also Locally	1987	II
	- Many mills have already ordered new machines and the situation should improve bur there is still a gap of investment.	- decision of future finishing "type wash and wear" (consulting of suppliers)	1987	II
		- investment of additionals machines .	1987	III
	- Silk finishing is an art and needs experiences, eyes and hands must guide to a great part finishing processing. Also customers wishes are chnging according fashion tendencies			

FOR CORPORATIONS AND MILLS

Base of Problem	Problem	Proposals for actions to be taken	Date	Priority
Education for electronic maintenance	- all new machines made in Europe and Japan are nowaday widely controlled and guided by electronic devices - break down situations become seldom, but when it happens trouble shooting for repair is more difficult and requieres trained personal	- selection of appropriate personal for education in electronic maintenance - training courses at supplieres for big machinery - instructions and trouble shooting by suppliers when installing machines, (more intensive compared to traditional machinery)	Start 1986	I
AUTO-Dispersing Systems for Chemicals & Dyestuff	- China is weighting all by hand, partly with very old fashion balance-systems - In many modern plant auto-dispensing have proofed better accuracy and save of products up to 1/3. (Dyehous, Printing)	- formation of study-groups to evaluate future auto-dispensing (medium term decision for investment) - When specialists are in Europe contact experienced mills, mainly in Italy	1987 1987	II III II

Silk Discharge Colours by Rongalite C (Flat Screen on table)

Resist printing by Thiotan WS (Rotary Screen on table)