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ASSISTANCE IN THE DEVELOPMENT OF NEW
ACTIVITIES FOR RESEARCH AND DEVELOPMENT
OF LEATHER AND ALLIED INDUSTRIES

DP/INS/85/016/11-51

INDONESIA

Technical report: Maintenance and maintenance training

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

Based on the work of Geoffrey F. Shilkin,
tannery consultant

Backstopping officer: J. Buljan, Agro-based Industries Branch

United Nations Industrial Development Organization
Vienna

Explanatory notes

The abbreviation i.d. stands for internal dimensions.

The monetary unit in Indonesia is the rupiah (Rp); \$US 1 = 1643 Rp.

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ABSTRACT

One of the main aims of the project DP/INS/85/016 is to strengthen the capacity of the Institute for Research and Development of Leather and Allied Industries (IRDLAI) for applied research and extension services in the field of the tanning industry. To achieve this aim, the IRDLAI pilot plant is to be rehabilitated and upgraded and the maintenance unit thoroughly restructured so it can provide improved services to the pilot plant as well as to the Indonesian tanning sector.

The tannery machine maintenance segment of this programme began on 27 September 1987 and lasted for three months. Broadly speaking, the goals of this particular segment - which included the installation and commissioning of new equipment, maintenance work at the pilot plant and extension service facilities and training of maintenance personnel - was satisfactorily achieved. The expert was forced to conclude, however, that at present the skills of the IRDLAI maintenance personnel are not at the level required to satisfactorily service the machinery and equipment installed. Further comprehensive training to remedy that situation is needed.

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INTRODUCTION

The requirement of the Institute for Research and Development of Leather and Allied Industries (IRDLAI) for direct maintenance and training of maintenance staff was the basis for the ad hoc short-term appointment of an expert on the maintenance of tannery machinery. Before the expert was fielded, it had been agreed with the backstopping officer, J. Buljan, that the expert would also assemble, install and commission the machines that had been recently supplied to IRDLAI by the project.

The expert arrived at the duty station, Yogyakarta, on 29 September 1987, following a one-day briefing in the UNDP office at Jakarta. The original duration of the mission was two months, but after three weeks the National Project Director (NPD), the Chief Technical Adviser (CTA) and the Senior Industrial Development Field Adviser (SIDFA) agreed to extend it by one month.

The objectives of the mission were:

- (a) To provide direct maintenance services to the IRDLAI tannery pilot plant;
- (b) To provide the IRDLAI tannery pilot plant with a preventive maintenance schedule, as well as a modus operandi for ad hoc maintenance;
- (c) To train counterparts in maintenance procedures and suggest further training in the form of fellowships for maintenance staff;
- (d) To provide extension service maintenance, as required, to the tanning industry sector;
- (e) To construct and commission new equipment.

Additionally, it had been agreed that a complete overhaul and revitalization of the maintenance department (officially referred to as the utilities and instrumentation unit) was called for, with respect to location, equipment and organizational structure.

The objectives, as described, were generally achieved, with compromise in some areas with regard to the quality of the results. The need for compromise is directly related to the maintenance situation at IRDLAI, as the body of the report will show.

Within the constraints of various policies and of local customs and practices, all those staff members of IRDLAI who became involved in the programme did their best to help achieve the goals set.

RECOMMENDATIONS

1. Selected members of the maintenance team should be given the opportunity for UNIDO-assisted study and practical training at appropriate technical institutions acceptable to UNIDO and within Indonesia. This training should be in the areas of electric-arc welding, oxy-acetylene cutting and welding/brazing, machine-tool operation, use of hand tools etc. The trainees must take the course seriously and UNIDO must be given evidence of its successful completion, including attendance records.

2. No fellowship in maintenance should be granted until the prospective fellow is able to converse freely in English. Maintenance cannot be learned from books, and successful oral communication is essential to any fellowship programme.

3. The relevant ministries should be more closely attuned to the needs of the various segments of the leather industry. At present, equipment resources are being underutilized, improperly handled or, worse still, left unused in one location whilst being desperately needed in another. The lack of close, frequent contact between the various sectors results in the duplication of equipment and an inefficient use of resources. Communication and information dissemination should be strongly encouraged.

4. In future, serious consideration should be given to the purchase of reconditioned machinery from reputable sources. This would allow a broader range of machines of recent manufacture to be incorporated into the industry without unduly straining the budget. Managers of the common service facilities and entrepreneurs would benefit from the improved capacity and range of services without being burdened by the adjustment and maintenance problems associated with high-tech equipment.

5. A programme of exchange should be initiated between maintenance staffs at IRDLAI, at the common service facilities and at the Academy of Leather Technology. This direct transfer of information would promote an understanding of local problems and would rapidly improve the techniques in use.

6. In any future development programme, close liaison between all parties should be a primary goal. Equipment installation should dovetail with building construction and provision of services, thereby avoiding additional costs that were incurred in the course of the current project.

7. Future equipment at the IRDLAI could include:

- New vacuum dryer with chiller
- Setting-out machine with sammying or heated top roller
- Roller coater
- Polishing machine with buffing cylinder
- Electronic bench-type measuring machine

8. Future equipment at the Magetan common service facility (CSF) should include:

- Shaving machine, 1,300 mm working width
- Toggle unit
- Brush dust removal machine
- Polishing machine
- Electronic bench-type measuring machine

The vibration staker at IRDLAI could be transferred to this CSF and replaced with a hydraulic unit, which would be more suited to a research function.

9. The Garut CSF could benefit from the following equipment:

- Hydraulic splitting machine
- Multi-table vacuum dryer with chiller
- Toggling unit
- Setting-out machine with sammying top roller
- Buffing and dust removal line
- Polishing machine
- Electronic bench-type measuring machine

A well-equipped and well-staffed maintenance workshop is needed to service the CSF and the cluster.

I. NEW MACHINERY

A. Installation

The activity of overriding importance was to commission the machinery that had been supplied to the project and delivered before the arrival of the UNIDO consultant. This function is sometimes carried out by nationals of the recipient country, especially when the equipment is relatively uncomplicated. In this case, however, it was considered advisable that it be carried out by the expert.

Vibration staker

The only machine that could immediately be prepared for operation was the vibration staker. It had been satisfactorily located on a suitable foundation and needed only connecting to a source of power and a pre-start check before operators could be trained on it and its operation explained to counterparts.

It was necessary to fit some sort of scale to the machine to measure transport belt speeds so they could be reproduced accurately, allowing the same staking effect to be achieved on similar types of leather whenever required. A system was devised by the expert and rigged by maintenance staff.

Hydraulic press and rotary ironer

The hydraulic press and rotary ironing machine were also located on foundations and awaiting power connection and a pre-start check. Unfortunately, they had been set down on the wrong foundations by the transport company. The press could have remained on the foundation where it was, even though that foundation was much too large. The rotary ironer, however, was sitting on wooden blocks because it overhung its much-too-small foundation, which had presumably been prepared for the press.

It was therefore necessary to switch the positions of the two machines. This took quite some time, as it required the services of an outside contractor. The matter was further complicated by the fact that the press had suffered extensive, although superficial, damage while being unloaded from the transport vehicle, and IRDLAI staff had been very concerned that further substantial difficulties would be encountered. In the end, the exchange took place without a hitch, and the commissioning of the two units was able to proceed. Both machines finally became operational, but only after further difficulties had been overcome. These related to the supply of hydraulic oil and to the clearance and delivery of replacement parts for the press.

Automatic sprayer

The automatic spraying machine presented a further set of problems. It had been taken to the upper floor of the building for assembly without anyone having been aware that some 23 metres of clear floor length would be needed for its installation and operation. Had it been left on that floor, it would have occupied more than half the available space on the floor and severely limited the use of the remaining space. It was therefore decided, after considerable thought, measuring and discussion, to install the sprayer downstairs.

This solution required some structural alterations, as a large concrete bench and a machine foundation had to be demolished. Then, the machine had to be brought down from the upper floor piece by piece. It was eventually assembled and commissioned to the satisfaction of the expert, but much more slowly than had originally been expected.

B. Comments on machines

Vibration staker

Whilst the machine provided to the project had many positive features and gave a good staking result, it also had one major drawback from the standpoint of IRDLAI operations. Changing the staking settings is a tedious process that requires the complete undoing and removal of 16 bolts each time. When trial stakings of various types of leather are carried out in very small runs, a great deal of time is spent changing the settings. This wastes time and accelerates wear on the thread of the holes in the adjustment housing. It also makes it tempting to compromise on staking effect in order to avoid changing settings.

Regrettably, funds available did not allow the purchase of a hydraulic machine whose settings could be rapidly and simply altered to suit the type of leather being trialed. Such a piece of equipment would have been more appropriate and would have made it easier to demonstrate the importance of this mechanical function in leather-making and to deal with the great variety of material being worked.

Hydraulic press

An important characteristic of the IRDLAI hydraulic press was the size that had been chosen for the platen. The press had a capacity of 330 metric tons and a platen size of 137 cm x 100 cm, giving a low (24.5 kg/cm²) pressure. A 137 cm x 66 cm platen would have given a higher (36.5 kg/cm²) pressure and still have been large enough for experimental work. Moreover, when new designs are wanted, the new platens would have been less expensive. On the other hand a larger platen is more suitable for plating larger skins, especially hides, and the output is higher.

Rotary ironer

The rotary ironer also had a problem, but this was due to overspecification by the manufacturer. On commissioning the machine, it was discovered that the capacity of the exhaust fan for the dust extraction system was far greater than it needed to be for skins and light sides. This caused two serious problems in operation.

The first was that the suction of air passing the temperature probe for the heated roller caused an artificially low reading. This prevented the heater from operating automatically and raised the temperature far above the required temperature. The only solution was to disconnect the extractor duct under the probe. Unfortunately, this remedy reduced the air flow and compromised the extraction efficiency.

The second problem was (and still is, as it remains unsolved) similar, except that it occurred at the two ducts under the spreading cylinder. There, the suction was so strong that when goatskins or very soft sides were being ironed, it was extremely difficult for the operator to keep them from being drawn in towards the ducts and then, as a consequence, pulled around the cylinder and out of his grasp. There did not seem to be a practical solution short of changing the exhaust fan itself. This, of course, was almost impossible as the fan was an integral part of the dust collection system. The alternative was to reduce the suction by bleeding in air to the main extraction duct to the fan by cutting holes in it; this was also the solution subsequently recommended by the manufacturer of the machine.

C. Conclusion

Although the machines were to be installed in a building constructed primarily for that purpose, it was obvious that there should have been better planning and co-ordination of the construction and infrastructure work to accommodate machines to be installed; but observation is noted despite the fact that, due to circumstances, machines and equipment had been bought in batches, with long intervals between.

Should there be any programme in the future to complete the building along the lines originally intended, careful consideration should be given to relocating equipment and machines, during construction, in order to obtain the optimum use of the available space and to follow as much as possible the accepted flow pattern of leather through the manufacturing process.

II. MAINTENANCE DEPARTMENT

A. Background

The second goal of the mission was to establish a maintenance unit to provide improved services to the IRDLAI pilot plant as well as to the Indonesian tanning sector. Before this goal could be realized, the entire maintenance structure had to be carefully examined.

The expert found that the personnel of the department had been stationed at an unsuitable location at the north end of the new building, well out of the mainstream of IRDLAI activities. He also found that whilst the maintenance machinery was adequate for the work expected to be done in-house, it needed maintenance itself, as well as proper installation. Overall, modifications needed to be made and appropriate action taken to reflect current maintenance practices in developed countries.

B. Activities

Personnel

The most pressing problem, and undoubtedly the most difficult, was (and still is) to improve the motivation of the maintenance personnel ^{1/} and, just as importantly, to convince the rest of the IRDLAI establishment that they could make use of and benefit from an active and competent maintenance department exists.

The first step in solving the problem was to generate an interest in the work programme and to try and involve all the maintenance workers in the daily activities. The next step was to restore their identity as a department. This was done by moving them to a more practical and central location and by providing them with uniforms suitable to the work they were doing.

Relocation

Bringing all the activities of the department together was seen by the expert as being essential to its resurrection and to improving the attitude of the maintenance personnel, who said that they had had no real headquarters for their operations for the last two years and had been unable to settle anywhere for very long. ^{2/}

After careful thought and lengthy discussion, a decision was taken to relocate the department into three adjacent rooms that also connected directly to the main electric switch room. These rooms, which are centrally located, will bring some basic order to the operation and, hopefully, form a core for the revitalization of an almost defunct department.

The largest room houses the administration, records and lockers of the workers. The next room houses the spare parts and tools, as well as records applicable to the release and return of tools and the stock of spares. The

^{1/} For a list of personnel and their educational backgrounds, see annex I.

^{2/} See annex II for the text of the expert's memorandum to the NPD on this subject.

third room houses the maintenance machines. Electrical spares are kept in an ante-room to the main electric switch room. Outside the machine room is a covered area with work-benches, an electric welding area, and a woodworking machine.

The whole area was cleaned, repainted, rewired, properly laid out and organized. If this situation can be perpetuated, then the chances of success are good.

Machines

The maintenance machinery (see annex III) was relocated and reorganized to allow greater flexibility and better management of these critical items. Each machine now has its own storage locker to hold the tools and components that pertain to it. Tools are properly stored and will be instantly to hand when required.

Each machine was given its own electrical circuit and isolating switch, an improvement over the existing bare wires and broken plugs. The entry to the room had a ramp so that equipment could be wheeled in on a trolley or lifter to minimize handling and damage.

All machines were properly cleaned and checked and a prioritized list of work to be done was drawn up.

A shielding system was designed for the welding area so that passers-by would not have their eyesight endangered if the welder happened to arc. A dry cupboard was constructed from an old laboratory oven to keep welding electrodes dry and safe from damage or loss. Work-benches were made accessible and given power points and shelving.

C. Fellowships and training

A fellowship for maintenance has been provided that focuses narrowly on tannery machinery. Serious consideration must be given, however, to a training course that would impart a broader view, as the level of understanding of maintenance by the maintenance team and the rest of the IRDLAI establishment is poor.

Whilst investigating the cause of a malfunction in an incubator in the effluents treatment laboratory, the expert asked if the matter had been referred to the maintenance department. The answer was that there was no maintenance department. When he then asked about the work of the fifteen members of the department, the further answer was that they just repaired water pumps and the like but did not do any maintenance. This was not an isolated incident. There were many other occasions when the same, or similar, comments were heard.

Skills are undeveloped in most members of the department. Of the 15, only one is a reasonably competent electric welder. The same man is also considered to be the best at lathe work. Most of the others are somewhat hesitant to try, whether from ignorance or embarrassment is not known.

The person nominated for the overseas fellowship should not be sent until he has a good grasp of English, a good understanding of machine shop practice, a working knowledge of electrical equipment and installations. The present nominee is deficient in most of these areas and would not be able to communicate well enough in English. This is seen to be a critical qualification as

both he and the people he would work with, Italians, would be using a foreign language, English. If any worthwhile benefit is to be gained from a fellowship, the nominee must first be given training to upgrade him.

A number of the department's staff would benefit greatly from practical courses in several important areas of engineering and mechanics. There must be some institution of standing in Indonesia where staff could be sent, with UNIDO assistance, to improve their basic skills in electric-arc welding, oxy-acetylene cutting and welding, machine-shop practice and hand-tool work. Training in the proper use and care of tools and equipment would also help; it should teach, for example, how to sharpen a high-speed drill bit or prepare a lathe tool.

The desire to learn and, having learned, to make use of the knowledge would be essential qualities to look for in choosing a candidate from amongst those who showed some promise during the period of the mission. Age and scholastic achievement are not always of paramount importance in the maintenance field. An understanding, appreciation and instinct for machines and equipment are at least as valuable as a . academic degree.

III. INSTITUTE FOR RESEARCH AND DEVELOPMENT OF LEATHER AND ALLIED INDUSTRIES

A. Background

The mission being reported on here, the short-term consultancy on maintenance, DP/INS/85/016, is the latest in a long series of missions undertaken at the Institute for Research and Development of Leather and Allied Industries (IRDLAI). Reading the reports relating to those earlier assignments has only strengthened the impressions gained by the expert during his mission. So far, emphasis has been placed on strengthening the infrastructure of IRDLAI and on "building" the institution. It would appear that now is the time to take stock of the situation.

B. Findings

The expert's first survey of IRDLAI showed an overstuffed and, to a great extent, underutilized operation. Records of equipment were incomplete and incorrect. Information was very slow in coming and often misleading. Many items of equipment had been misused and then left unattended without any sensible attempt at repair. A general lack of appropriate concern with the way equipment should be treated pervaded the entire organization. Had a proper maintenance department been operating (as it could have) and had the rest of the staff recognized its function and purpose, considerable savings could have been realized and all the equipment installed at IRDLAI would be in better condition.

In every section of the establishment machines and pieces of equipment stood idle. Some had broken down; some had worn out from lack of lubrication. Others had been cast aside when their function was no longer required and allowed to deteriorate in the open. With all the will and enthusiasm in the world, it would take many months of non-stop effort on the part of the maintenance staff to overhaul, repair and restore the equipment at IRDLAI to full operating condition.

The all-important word at IRDLAI was "budget". Nothing could be discussed without the use of this word. This is all very well when the subject-matter is research projects, travel programmes, equipment upgrades or raw materials supply. It does not, however, work in the case of maintenance, because only after a piece of equipment has broken down can a budget be prepared, and this often takes time as the item must be dismantled and inspected and prices obtained for the repair or replacement. In the meantime, the equipment stands idle and the operation comes to a halt. It must be remembered, too, that while regular preventive maintenance may prevent a breakdown, occasionally some component suffers from fatigue or a design fault, and no amount of maintenance will prevent this.

For preventive maintenance to succeed, basic engineering items must be always on hand for the maintenance man to make use of when needed. Sometimes a regular check must be fitted into a rest period for the machine or process. Then, if some minor repair is needed it must be co-ordinated with the next available time slot in the machine's programme. This sort of situation cannot wait for the budget cycle. By that time, the machine may be completely stopped and work held up or, worse still, negated by the enforced delay.

In an era when the Government is striving to upgrade the leather industry and improve its chances for export, the cumbersome system of financial control could benefit from a careful study. As an example, there were times during

the mission when it was difficult to obtain even a few thousand rupiah for small items. Some pieces of equipment important to the work being done remained inoperable or were functioning without full control (over, for instance, temperature) for the want of a small, cheap, easily obtainable component. Furthermore, there is certainly room for improvement of co-operation and interaction among the various organizational units of IRDLAI.

C. Conclusion

The effort to revitalize the maintenance department of IRDLAI is a complex matter. It is not expected that the problems will be solved overnight: efforts to improve procedures, institutional policy and staff attitude, not only amongst the maintenance team but also amongst the whole IRDLAI establishment, should be continued.

IV. GAMBIRAN

A. Background and status

The common service facility (CSF) at Gambiran was established in 1980 on the basis of a design provided by UNIDO expert A. Lesuisse. Previously, it had been located at IRDLAI, but complaints from residents in the vicinity forced it to move to its present location. Now, although it is physically separate, it must continue to be considered as an integral component of IRDLAI, especially when future plans are being formulated.

The expert found that the Gambiran unit itself had an incomplete range of machines, even when those on site but not yet installed were taken into account. However, if its resources are thought of as also embracing the equipment at the main IRDLAI site equipment, including some items still to be installed there, the whole would approximate a complete commercial-scale tannery.

Gambiran is operating partly for the direct benefit of IRDLAI and partly as a common service facility for tanners in and around Yogyakarta. It only operates with chrome tanning; the pits for vegetable tan have never been used.

The overall standard of maintenance was found to be poor. Only 12 of 17 installed machines were usable, and of these, one was in urgent need of a major overhaul and the four operating drums needed attention. There were also three machines that had not been installed.

What finishing work was being done was by hand-spray onto an inclined frame, using a single Meiji hand-gun with one-litre suction pot. The sides were hung on sticks, placed on a rack and left to dry in the sun.

The tannery was supplied with water from three sources, all wells. One was for drinking and the other two for processing. The total storage capacity for process water was inadequate, and pressure was very poor.

The effluent system was rudimentary but could be vastly improved by simple modifications and some common sense.

The tannery was also equipped with an emergency generator, but this unit was not maintained in fully operational condition.

B. Equipment, status and repairs needed

Liming drum, i.d. 2,900 mm in diameter, 2,250 mm wide. Needs reinstalling, a new large door, new water feed and new drainage system. Not operational.

Liming drum, i.d. 2,400 mm in diameter, 1,600 mm wide. Needs reinstalling, a new large door, new water feed, new drainage system, motor and gearbox drive and switchgear. Not operational.

Liming drum, i.d. 2,000 mm in diameter, 1,300 mm wide. Needs a new pinion to reduce the operating speed to a level more suited to the process, a new large door, new water feed and new drainage system. Operational.

Fleshing machine, Turner, pneumatic bed, 1,800 mm working width. A complete strip is necessary to ascertain the condition of this machine. Requires a new pneumatic tube. Not operational.

Fleshing machine, Turner, rubber roll skin type, 1,500 mm working width. The machine is badly out of adjustment and needs to be stripped to check its condition. Operational.

Splitting machine, Svit, mechanical-type, 1,800 mm working width. Needs a complete strip and check. Its condition may not warrant the cost of rebuilding. Not operational.

Splitting machine, Moenus, mechanical-type, 1,800 mm working width. Needs a complete overhaul to rectify the considerable wear to many components. Operational.

Tanning/retanning drum, i.d. 2,000 mm in diameter, 1,500 mm wide. Needs attention to drive, new large door, new water feed and improved drainage system. Operational.

Tanning/retanning drum, i.d. 2,000 mm in diameter, 1,000 mm wide. Needs attention to drive, new water feed, improved drainage system. Operational.

Sammying machine, Turner, roller-type, 1,800 mm working width. Urgently needs major overhaul and rebuilding. Many components missing. Operational.

Shaving machine, Flamar, 1,800 mm working width. Needs complete check and readjustment. Some repair work needed. Operational.

Shaving machine, BMD, 600 mm working width. Needs complete check, readjustment and repair work to some components. Hydraulic system needs overhaul. Not operational.

Ironing and embossing machine, Wright, Gloria roller type, 12 in. x 72 in. platen. Mechanical system with limit switches, all of which need overhaul. Operational.

Sole leather roller, Wright, 200 mm roller path. Mechanical system with fast and loose pulleys. Needs checking and, possibly, changing the drive of the brake motor and the limit switches. Operational.

Staking machine, Turner, Slocomb-type with clamp. Needs general check and adjustment. Both steel and fibre blades need replacing. Operational.

Measuring machine, Turner, pinwheel-type, 1,800 mm working width. Needs cleaning. Operational.

Glazing machine, Moenus. Appears to be in acceptable working order. Not installed.

Glazing machine, Turner, level-bed type. Appears to be in acceptable working order. Not installed.

Spraying machine, Wright, moving-bed, hand-spray, with dryer. Appears to be complete and only in need of assembly and stringing of conveyor.

The standard of maintenance was not acceptable at this plant, especially in view of the fact that IRDLAI had three men permanently stationed at Gambiran solely for this purpose.

C. Conclusion

The expert made four visits to Gambiran. The first, in company with fellow expert Paulovits, resulted in a lengthy discussion with the CIA, followed by a detailed inspection visit. On the third visit, which took place on 4 November 1987, the expert was accompanied by the visiting backstopping officer, J. Berg; the CIA; and expert Paulovits.

As a result of the third visit and the ensuing discussions, it became possible to suggest a future course of development for Gambiran and IRDLAI as a whole. An outline of these ideas (annex IV) was given to the Senior Industrial Development Field Adviser (SIDFA) during his visit to IRDLAI, at which time the fourth visit to Gambiran took place.

It was obvious that the potential of IRDLAI to become a catalyst for the future development of the Indonesian leather industry had not been fully mobilized. A serious programme of equipment repair, overhaul and relocation, together with an upgrading of services, is warranted. In any event, an extensive repair programme will be necessary to allow the facility to continue to offer services to local tanners.

V. MAGETAN

A. Background

The Magetan common service facility (CSF) was visited from 16 to 18 November 1987, during which time an inspection was made.

The equipment for the tannery operations and maintenance was seen to be housed in five buildings. The facility had originally been equipped with tannery machines in 1981, and these had been added to in 1983 (annex V). With the exception of the bark grinder, the hydraulic press, and the setting-out machine, all machinery comes from the Republic of Korea. There was a staking machine on loan from IRDLAI and a staking wheel of local manufacture that had been installed in 1987.

The level of maintenance was low. This came as no surprise, as the manager of the facility has tried to be all things to all people. He has maintenance staff to carry out work, but is apparently the only one competent to control the maintenance. The approach was not working, as even a cursory inspection of the equipment showed. The maintenance workshop and its equipment bore witness to the lack of maintenance: they were in an as-new condition, even as the production machinery was in dire need of attention.

B. Machinery, status and repairs needed

Fleshing machine, San Gok, 1,500 mm working width. This machine was not operational during the inspection as a gearbox for the feed roller was away for unspecified repairs. In the meantime, the machine had been painted instead of being given the complete overhaul which it needed. Oil leaked from the hydraulic pump, the bushes on the feed roller journals were worn, there was play in the grinder etc.

Fleshing machine, San Gok, 2,700 mm working width. An inappropriate item to have in any Indonesian tannery, given the preponderance of Zebu strain cattle. No hides with the Zebu hump could be fleshed whole without severe damage to the shoulder end of the hide.

To make matters worse, the machine could not be used, according to the CSF manager, because it purportedly needed more power than was available from the facility supply. The expert was at a loss to understand the allegation, given the installed power capacity and the fact that the bark grinder had a motor of similar horsepower and was run regularly. ^{3/} It is more than likely that they simply cannot be run at the same time (simultaneously).

Notwithstanding the above comments, the machine was in as-new condition. If it is not being used, it should be sold to generate funds sorely needed to improve and expand the range of machines and services available to the Magetan tanners.

^{3/} From the 1983 technical report of W. Scott, leather industry expert: "The MIE and CSFC in Magetan is running very well with all the machinery it is likely to need at this time. One difficulty the management there have encountered is that they have insufficient electrical power to run the hide fleshing machine. This machine is too large for sides and as the capacity of the other machinery is for sides, it seems unlikely that the machine will ever be used to any great extent" (UC/INS/83/071, p. 17).

Splitting machine, San Gok, 1,800 mm working width. Very little of a positive nature could be said about this machine. The bevel of the knife was wrong; there was no backing strip for the knife; the backing plate adjustments were frozen; the rubber roll needed grinding, section rollers needed cleaning; the grindstones were of different diameters and clogged with grease. The machine had not been cleaned since the last time it was used (flesh was caught between section rollers). The edge of the table needed machining and presumably the jaws also needed attention.

In spite of the above problems, the machine still ran and sides were split. This was a tribute to the skill of the operators more than anything else.

Drum, no dimensions taken. Although the drum was running on both days, it was in need of attention. The door leaked, the pinion was loose on its shaft and the chain drive was misaligned. A feed hopper fitted to the drum would help also.

Setting-out machine, Moenus-Turner, 1,800 mm working width, sammying function. This machine also needed adjustment. There was unequal pressure on the feed roller and signs of wear on some bushes. An advanced stage of rust showed on the back covers, which could not be opened, and the sammying felt had obviously not been washed or cleaned for a long time.

Shaving machine, San Gok, 450 mm working width. Generally this machine appeared to be in reasonable condition. However, it needed to have the cylinder rebladed, and there was no spare cylinder. No shaving machine should be bought without a spare cylinder. The spare is always kept rebladed and ready for use so there will be a minimum of delay to shaving operations.

The machine was dirty and its fan was missing a paddle and was caked with dry shavings. A good cleaning and a careful check while the cylinder is being rebladed would be very worthwhile.

The CSF manager said that it would take a week to change the blades in the cylinder. This estimate was considered by the expert to be excessive. A 450 mm cylinder should need no more than 8 hours for a change of blades and reinstallation. Even allowing for local working hours and habits, two days would be the absolute maximum.

Staking machine, San Gok, Slocomb-type. Another machine in need of attention. The top beam needed repair and the top fibre blade was chipped. The bottom blades were rounded and out of adjustment. There was no sign of lubrication. The machine was operable but could be in much better condition.

Staking machine, Wright, Slocomb-type, on loan from IERLAI. This machine was fitted with a triple roller head. One blade was missing and all the others were worn and needed either dressing or replacing. The bottom slide adjustment was broken.

Staking wheel, locally manufactured, 300 mm working width. Installed this year and in good condition, but it had no dust bag.

Buffing machine, San Gok, 600 mm working width. The cylinder urgently needed a new base paper correctly cut and fitted. There were no end plates on the cylinder and dust was packed hard inside the drum. The cylinder brush was driven by a string instead of a belt. The oscillator was worn and the machine vibrated when running. There was no safety equipment of any type fitted to the machine. Dust extraction and collection were innovative but rudimentary.

Hydraulic press, Mostardini, MP2,137 ca x 66 cm platen. Apparently the oil had not been changed in the machine since installation, nor had the filters been cleaned. The rubber mat, which should only be used for plating and not for embossing, was well overdue for a change. One heater element read two degrees higher than the other two, but no one had thought to check it. The fan end bearing in the pump motor was whistling and would need changing soon. No replacement had been ordered and no one was concerned about the noise.

Sole roller, unknown make, 200 mm roller. Operating quite well in spite of the fast and loose pulley system, which was overdue for replacement. A brake motor would be the best solution. The pressure plate was also worn and needed either turning or replacing.

Bark mill (disintegrator), unknown make, dimensions unknown. No sign of lubrication on a unit essential to the whole of the Magetan industry. There was an imbalance in the mill when running, the fan end bearing on the motor was running dry and dust was blowing out of several joints in the installation. This critical unit operates in a very hostile environment and should be given daily attention to ensure its continued operation. The whole bark grinding set-up was bad, presenting a severe health hazard.

C. Equipment required

During the visit of the expert, the manager presented a list of machines he considered were needed for the CSF:

- 1 vacuum drying unit
- 1 toggling machine
- 1 vibration staker
- 3 shaving machines
- 1 splitting machine
- 1 lift-up staker
- 1 brushing machine
- 1 polishing machine

No working dimensions or makes were specified and no priority was set.

D. Conclusion

A regular preventive maintenance programme was lacking at the facility, and the price of this lack is very high. It is likely that some training in maintenance procedures and practices would pay handsome dividends, in terms of both the budget of the CSF and the production levels and quality of the work done for tanners in the cluster.

VI. GARUT

A. Background

A visit was made to this common service facility (CSF) from 29 November to 1 December 1987, at which time an inspection was carried out.

The equipment for tannery operations and maintenance was seen to be housed in four buildings. The facility had originally been equipped with tannery machines in 1980-1981, with further machines having been added in 1983-1984 and again in 1986 (annex VI).

The machinery was from two suppliers, one Taiwanese and the other Italian. In general terms, maintenance was poor, as was the standard of housekeeping at the CSF. The latest machines were still in good condition but showed signs of lack of attention.

Some of the maintenance problems came simply from a lack of attention and some came from the way in which the leather was being offered to the machine for processing.

Apart from a few hand tools, maintenance equipment was non-existent. The statement by the CSF manager that "everything which cannot be repaired on site is taken to Bandung" indicated that almost every job needed to be done outside. Probably repairs are neglected until it is imperative that they be done, and then the work takes longer and costs more because of the deteriorated condition of the item.

B. Machinery, status and repairs needed

Splitting machine, Goldfield, 1,800 mm working width. This machine was clearly showing its age. There were worn bushes and journals throughout. The rubber roll needed grinding and all jaws wanted dressing. A complete overhaul would almost not be worthwhile. It might make more sense to scrap this machine since there is a newer machine of the same make that could use many of the parts of the older machine.

Splitting machine, Goldfield, 1,800 mm working width. Although a much younger machine, it too showed signs of bad wear. Bushes and journals were worn and the rubber roller badly needed grinding.

Shaving machines, Rizzi, 600 mm working width. All three machines had been poorly kept. They were dirty and dried shavings adhered to the fans, which were out of adjustment. Two of the wooden work tables were almost worn away and the third was not in much better condition. Obviously, they had been worked hard.

Shaving machine, Goldfield, 1,050 mm working width. This was a relatively new machine, still in good condition and reasonably well maintained.

Vibration staker, Goldfield, 1,600 mm working width. Also a relatively new machine, its top belt had been replaced by a locally made substitute until a new belt could be fitted. The expert suspects that the setting of the machine was rarely changed as the large spanner for moving the cams was locked up in a small room where tools are kept and was buried under a lot of other equipment. This machine was in reasonable condition.

Through-feed ironer, Goldfield, 1,500 mm working width. Bought at the same time as the other machines, but no care had been taken of the feed belt, which was very dry, not tracking and very dirty. The heated roller had a scum on the chrome and several pits where perhaps nails or stones had been fed through the machine and damaged the roller.

Experimental drum, locally made, no dimensions taken. This piece of equipment was not in use at the time. The door would not close even though it was of stainless steel and had a spring handle locking. The wood was dried out.

C. Equipment required

The CSF manager provided a list of machines he considered to be essential for the continued successful operation of the facility:

- 1 fleshing machine
- 1 ironing machine
- 1 sanmying machine
- 1 setting-out machine
- 1 oven
- 1 buffing machine
- 1 embossing press
- 1 spraying machine
- 1 trimming machine
- 1 measuring machine

No working dimensions or makes were specified and no priorities were given.

D. Conclusion

The facility's maintenance man previously worked at another (non-IRDLAI) tannery in Garut, so his machine experience was limited. He had attended a one-month training program at IRDLAI in 1982. Presumably he was present when a maintenance team of two from IRDLAI visited Garut in July 1983 to repair and adjust the splitting machine.

Housekeeping was not good. Shavings were piled high around all machines. Limed hides brought for splitting had been allowed to drop on muddy ground before being split. Drainage from the old splitter was running out into the yard and forming a mud patch.

The two splitters were housed separately, one with the three small shavers and one with the larger shaver. The ironer and the staker occupied the same relatively small building and there was no control of staker dust.

Overall, the picture was unsatisfactory: low-grade maintenance, poor housekeeping, overworked machines and no resources.

The initiative of the local manager of the Direktorat Jendral Industri Kecil (DJIK), who had applied to sell the unused generating plant to raise funds for urgent works and spares, seemed justified.

VII. OVERALL CONCLUSION

The expert feels strongly that his mission was only a partial success. Indeed, the machines provided to the project are installed and running and the maintenance staff have been relocated in more appropriate and acceptable surroundings. Direct maintenance was carried out by the expert and also by maintenance staff. Visits were made to the common service facilities, discussions held, and inspections and surveys carried out. Orientation on the newly installed machinery was given, and training and guidance in maintenance procedures undertaken. A report has been written.

It would seem, on the face of it, that all aspects of the mission were completed. However, motivation, one of the most important ingredients in the success of a mission, has to be strengthened. The people receiving the assistance have to want to do a good job and be proud of their work and care for their equipment and be satisfied that they have done their best. Further effort in this direction is considered essential.

Annex I

PERSONNEL OF THE MAINTENANCE DEPARTMENT

<u>Name</u>	<u>Educational background a/</u>	<u>Function</u>
Sukardjo	Technical high school (E)	Chief of section
Asmongin	Technical high school (E)	Staff
Sukaryono	Technical high school (E)	Staff
Kusmiyadi	Technical high school (E)	Staff
Mujiono A.	Technical high school (E)	Staff
Haris Mustofa	Technical high school (GM)	Staff
Tugiman	Technical high school (GM)	Staff
Hardono	Technical high school (GM)	Staff
Rawanto	Technical high school (GM)	Staff
Suharto	Technical high school (GM)	Staff
Janjung Ponco Purwandono	S.A.I.G. of the Institute for Technology, Bandung (metal ware)	Staff
Sujarwoko	Senior high school	Staff
Sakoen	High school construction machine	Staff
Gino	High school construction machine	Staff
Soekemi	High school construction machine	Staff
Sunardi (Gambiran)	Technical high school (GM)	Staff
Sardjo (Gambiran)	Technical high school (E)	Staff
Suryono (Gambiran)	Technical high school (E)	Staff

a/ E = electricity; GM = general machine.

Annex II

MEMORANDUM FROM THE EXPERT TO THE NATIONAL PROJECT DIRECTOR,
9 NOVEMBER 1987: RELOCATION OF THE MAINTENANCE DIVISION a/

If the most important and heavily emphasized segment of my work is to be successfully completed then it is imperative to restructure the maintenance department and locate it in a permanent home with all the necessary facilities to enable it to operate efficiently and successfully.

At present the whole department is in a parlous state, with no leadership, no home, no morale and no results. The first step is to re-establish the departmental identity by giving the personnel a permanent home and a new image. The next step is to make a clear statement to the entire IRDLAI staff as to the reason for, function of and responsibility of the department and its personnel, and to make certain that this is recognised, respected and used.

No independent ad hoc repairs should be undertaken by anyone but maintenance personnel and these actions should be immediate and effective - with the section concerned with the equipment, being kept fully informed.

A maximum of effort, minimum of paperwork and minimum of time should be used to produce the results. Obstacles such as approvals of a complex nature and demands for drawings or explanations which will not be understood (or read) should be dispensed with. The most important aspect is that the item of equipment is put back in service as speedily as possible, as cheaply as possible, BUT at the same time in the best possible condition for continued service.

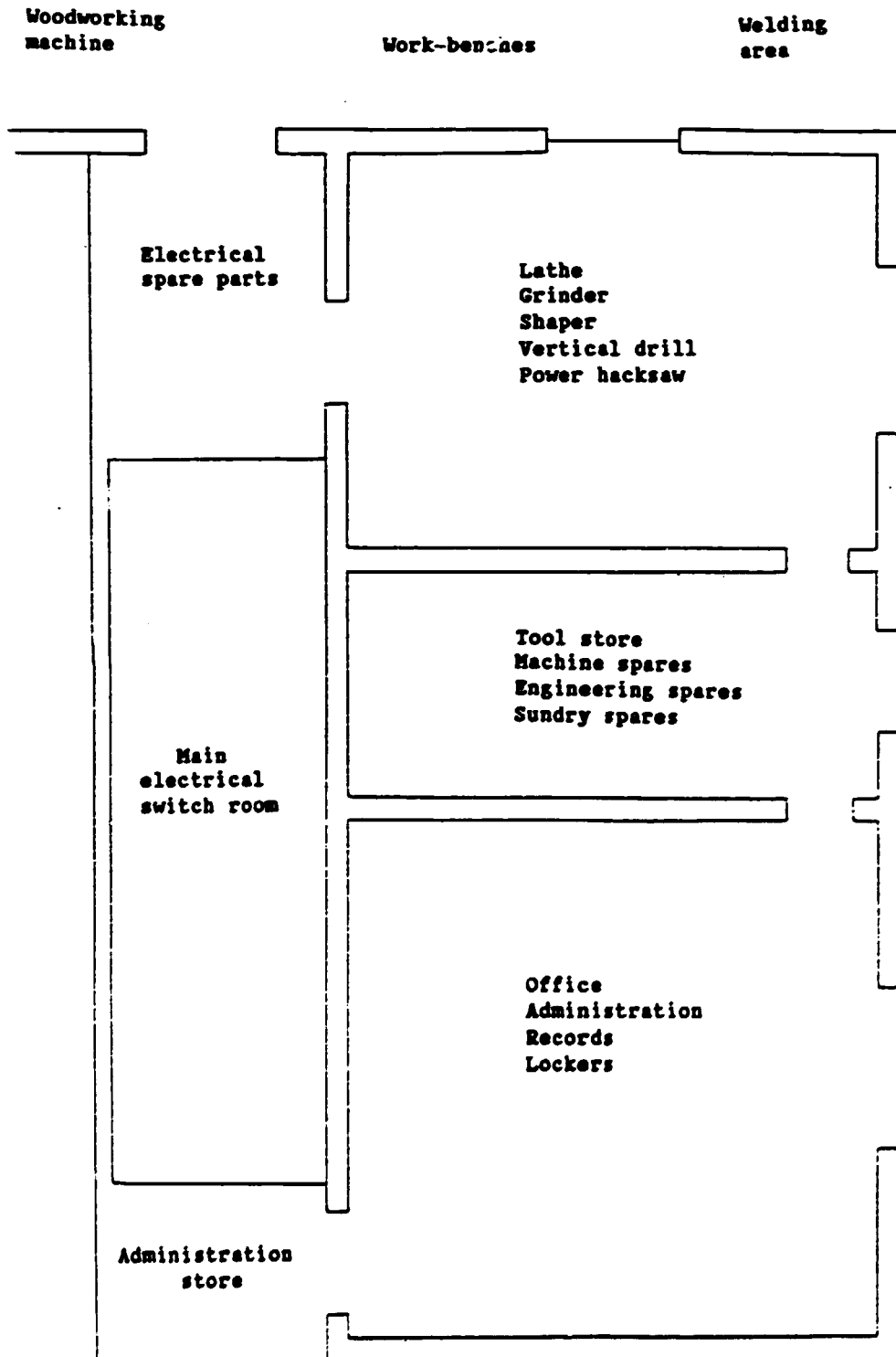
In order to achieve all of the above goals, the following actions should urgently be approved and taken.

1. The maintenance department should be permanently located in the area shown on the accompanying drawing.
2. Leather store to be relocated to upstairs in new building in room previously allocated to hand spray.
3. Rice room should be relocated to area currently used as change room by maintenance or other suitable location.
4. Maintenance team to be issued with suitable work uniform (overalls and safety booth) which should be worn at all times when at work.
5. All tools in institute, unless speciality item for a particular machine, to be put in toolstore under maintenance control.
6. No IRDLAI staff to make independent repairs this point to be clearly emphasized to all IRDLAI staff. Work to be taken to maintenance OR maintenance to be advised.
7. Regular preventative maintenance programme established and followed.
8. Domestic training of advanced level is needed in specific skills such as lathework (turning) electric and oxy acetylene welding to widen the capability of maintenance staff.

a/ This memorandum has not been edited.

9. A complete detailed record kept of all work so that weakness in the institute infrastructure can be high lighted and necessary corrective action taken.

It is necessary that action be taken urgently on all matters in this communication. Your early approval and return to me of a signed copy would be much appreciated.



Annex III

MAINTENANCE MACHINERY AT IRDLAI

Lathe, flat-bed, 100 mm between centres, 35 mm headstock

Shaper, 125 mm stroke

Vertical drill, No. 2, Morse taper

Power hacksaw, 350 mm blade, 120 mm stroke

Heavy-duty double-ended grinder

Electric arc welder, 10 gauge capacity

Woodworking machine, 100 mm cut