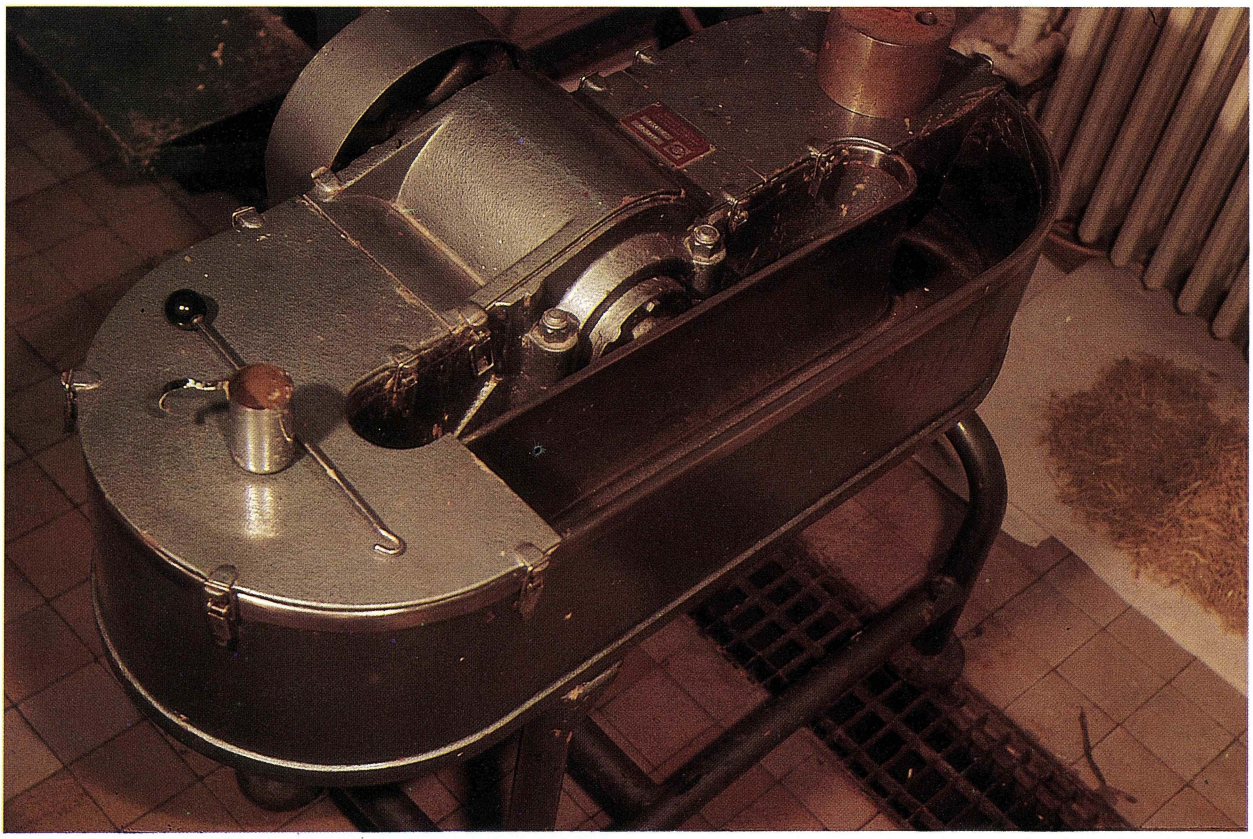

Photo C.T.F.T.

*C.T.F.T. Laboratoire de Cellulose. Pile raffineuse.*
C.T.F.T. Cellulose Laboratory. Valley type Beater.

# PULP AND PAPER IN ASEAN COUNTRIES TODAY AND TOMORROW

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RÉSUMÉ

**SITUATION ACTUELLE ET POTENTIALITÉS DES PAYS DE L'ASEAN EN MATIÈRE DE PÂTES ET PAPIERS**

*On expose tout d'abord la situation papetière d'ensemble des pays de l'ASEAN. L'industrie papetière est présente dans tous ces pays et les situations y sont très diverses. L'Indonésie représente l'élément le plus dynamique. On décrit ensuite les études de reconnaissance de la valeur papetière de bois feuillus et de résineux de ces régions, effectuées au C.T.F.T. Diversification, forte densité, grande longueur de fibres caractérisent les bois feuillus. Les caractéristiques papetières sont moyennes à bonnes. Les*

*résineux se situent entre le Pin maritime et le Pin sylvestre. Un essai semi-industriel a confirmé ces résultats. Le chanvre de Manille (Abaca) est un produit caractéristique des Philippines. On peut en tirer des pâtes très résistantes.*

*La situation papetière actuelle des pays de l'ASEAN est plutôt favorable du fait des ressources présentes et des ressources potentielles à partir d'espèces d'Eucalyptus de qualité.*

ABSTRACT

**PULP AND PAPER IN ASEAN COUNTRIES TODAY AND TOMORROW**

*The paper situation in all ASEAN COUNTRIES is first dealt with. Paper industry can be found in all these countries and situations vary widely. Indonesia represents the most dynamic element. Paper tests, which were carried out in the C.T.F.T., on the paper value of softwoods and hardwoods from these regions are then described. Softwoods are characterized by diversification, high density and big fiber length. Paper characteristics range from good to average. Hardwoods are in between maritime pine and Scotch pine. A test on a semi-industrial scale confirmed these results. Abaca (Musa textile) is a typical product from the Philippines. Highly resistant pulp can be made from it.*

*Today's paper situation in ASEAN countries is fairly favorable because of today's resources and of potential resources from high quality Eucalyptus species.*

# *SURVEY OF TODAY'S SITUATION IN ASEAN COUNTRIES*

*Certain economic data should be given for a better understanding of the paper situation. They are shown in Table 1.*

*The wide variety of situations can be seen from Table 1. Consumption per capita and per year is very low for Indonesia and the Philippines, moderate for Malaysia and Thailand, high for Singapore where it nearly reaches the level of most industrialized countries. Among the latter, let us mention the U.S.A. which rank first with 284 kg and France, which ranks among the average consumers with 119 kg.*

*Although, on the whole, the ASEAN countries consume few cellulose products, except for Singapore, they nevertheless rank higher than Africa, where consumption is about a few kg per inhabitant per year.*

*It can be noted that paper industry exists in every country, always with a certain number of paper and pulp mills and often both.*

*However, these data do not tell about the economic trends in 1986. The Philippines, for one, are in the midst of severe difficulties, that may be aggravated by their using only half of their paper capacity. Whereas in*

TABLE 1

ECONOMIC DATA FOR 1984-1985

| Countries | Population in million inhabitants | *Production capacity* Paper capacity (t) paper & board | pulp | Per capita consumption (kg) per year paper & board | Number of paper mills | Number of pulp mills |
|---|---|---|---|---|---|---|
| Indonesia | 150 | 877,000 | | 4 (e) | 35 | 16 |
| Philippines | 55 | 549,000 | 303,000 | 7 | 25 | 9 |
| Thailand | 50 | 450,000 | 110,000 | 11 (e) | 33 | 5 |
| Malaysia | 11.5 | — | — | 32 (e) | 13 | — |
| Singapore | 2.5 | 20,000 | — | 124 (e) | 2 | — |

*Source :* Pulp and Paper International : August 1986 - Annual Review.
(e) : estimated by Pulp and Paper International.

*Indonesia, two machines for newsprint started running, which increased yield by 150,000 t/year in this field. Malaysia is building a pulp mill using mixed tropical hardwoods which will have a 110,000 t/year yield.*

*All ASEAN countries import pulp and paper. The imports are shown in Table 2.*

TABLE 2

PULP AND PAPER IMPORTS IN 1985 (e)

| Countries | Paper & Board (t) | Pulp (t) | Wastepaper (t) |
|---|---|---|---|
| Indonesia | 250,000 | 300,000 | 40,000 |
| Philippines | 147,000 | 42,000 | 58,000 |
| Thailand | 162,000 | 120,000 | 120,000 |
| Malaysia | 312,000 | 7,000 | 120,000 |
| Singapore | 360,000 | 15,000 | — |

*Source :* PPI, August 1986 (e) = estimated by PPI.

*As can be seen from the table, there are two situations. Three countries,* i.e. *Indonesia, the Philippines and Thailand, import but depend relatively little on foreign countries thanks to their existing paper infrastructure ; two countries,* i.e. *Malaysia and Singapore not only do not manufacture pulp, but their paper industry does not cover their needs. (Singapore is a wastepaper exporting country too.)*

*It might be interesting to note that the increase of Indonesian imports were only half of those predicted by prospect studies. The latter indeed indicated an average of 550,000 tons per year over 1981-1985. In 1978, in this country, newsprint paper from Canada, New Zealand and Sweden constituted 36 % of total imports ; Kraft paper for concrete and fertilizers represented 23 % of total imported paper from the same countries. The third category,* i.e. *board and corrugated board for boxes, represented 14 % of imports, with Japan as the main supplier.*

*All the paper imports then represented 30 % of the needs, the rest being supplied by domestic yield (two thirds of which manufactured from import pulp).*

# *PAPER TESTS CARRIED OUT ON SOUTH EAST ASIAN WOODS IN THE C.T.F.T.*

*In the seventies, several French engineering firms took an interest in projects for the development of the paper industry in South East Asia from local resources. They asked the C.T.F.T. to assess the paper value of these resources. Thus some laboratory tests, some tests on a semi-industrial scale and an economic study of a pulp mill were carried out.*

*The numerous reports on the subject can be consulted in the Centre Technique Forestier Tropical.*

## *Brief description of samples*

*The C.T.F.T. studied a certain number of hardwood and softwood species and a fiber plant. Their list is given in Table 3.*

*If they are to be distinguished according to their geographical origin, their distribution is as follows :*

*— South Kalimantan : Ramin, Red Meranti, Red Keruing and White Keruing. They belong to the families Gonystylaceae and Dipterocarpaceae. Their precise variety could not always be determined. The softwoods* Agathis *and* Dacrydium *belong to this group.*

*— East Kalimantan : 22 species which are note listed in the table because the local name is not known to us ; they are representative of the East Kalimantan forest and 10 species from swamp forests (See S.f. abbreviation in Table 3).*

*— Malaysia : 17 softwood species were studied, with some Kalimantan Dipterocarpaceae among them.*

*— The Philippines : Lauan, Bengued Pine and Abaca were studied.*

## *Results*

*The results obtained in laboratories and those obtained on a semi-industrial scale are given separately, although no contradiction between either results was observed ; the purpose of such a presentation is to give an example of a working method for industrial applications.*

*The laboratory studies were carried out on wood quantities varying from 300 to 500 g depending on density, and 5 kg if the tests were done in 2 liter bomb or in 50 liter digester. The trials were duplicated.*

TABLE 3. — LIST OF PLANTING STOCK STUDIED AND ITS GEOGRAPHICAL ORIGIN

| Local name | Botanical name | Origin |
|---|---|---|
| HARDWOODS | | |
| Ramin | Ramin, *Gonystylus sp.* (Gonystylaceae) | |
| Red Meranti | (*Shorea conica* ? Dipterocarpaceae) | Kalimantan |
| White Meranti | *Shorea sp.* (*Shorea ovalis* ? Dipterocarpaceae) | |
| White Kerning | Doubtful, cf. *Hopea,* Dipterocarpaceae | |
| Tengkerungan | *Plectronia didyma* Rub. | |
| Bitangur | *Calophyllum sp.,* Gutt. | |
| Medang | *Dactylocladus sp.,* Melast | |
| Besungan | *Garcinia sp.,* Gutt. | |
| Merangau | *Shorea teysmanniana,* Dipt. | Kalimantan |
| Satan | *Ganua motleyana,* Sapot. | (Swamp forest) |
| Tempelengan | *Diospyros evena,* Eben. | |
| Tetopog | *Sterculia parviflora,* Sterc. | |
| Malepasse | *Baccaurea bracteata,* Euph. | |
| Sedapung | *Ilex cymosa,* Aquif. | |
| Dark red meranti | *Shorea sp.* | |
| Petaling | *Ochanostachys amentacea* | |
| Nyatoh | *Palaquium sp.* | |
| Kelat | *Eugenia dyeriana* | |
| Kembang semangkok | *Scaphium, cf. macropodum* | |
| Keranji | *Dialium laurinum* | Malaysia |
| Medang | *Litsea costalis* | |
| Light red meranti | *Shorea leprosula* | |
| Yellow meranti | *Shorea sp.* | |
| Keruing | *Dipterocarpus* | |
| Bintangor | *Calophyllum ferrugineum* | |
| Melunak | *Pentace sp.* | |
| Kedondong | *Santiria rubiginosa* | |
| Merpauh | *Swintonia* | |
| Seraya | *Shorea cf. curtisii* | |
| Mempisang | *Polyaltia sp.* | |
| Mempening | *Lithocarpus sp.* | |
| SOFTWOODS | | |
| Red Agathis | *Kaori, Agathis sp.* (Araucariaceae) | |
| White Agathis | *Kaori, Agathis sp.* (Araucariaceae) | Kalimantan |
| Dacrydium 1 | *Dacrydium sp.* (Podocarpaceae) | |
| Dacrydium 2 | *Dacrydium sp.* (Podocarpaceae) | |
| Benguet Pine | *Pinus kesyia (insularis)* | Philippines |
| MATERIAL OTHER THAN WOOD | | |
| Abaca | *Musa textilis* | Philippines |

*The trial on semi-industrial scale was carried out on two sample shipments of 2 tons of hardwoods previously studied in laboratory, assembled again so as to reconstitute the forest composition.*

*The two experiments differed by a few minor changes in the cooking diagram.*

*The constitution of mixtures is of great importance. One of the mixtures the C.T.F.T. is most interested in is the « representative » mixture,* i.e. *that which has a similar composition to the forest's. For South Kalimantan, the indications were supplied by the French mission. For East Kalimantan, the composition was determined by Kalimantan Forestry Department.*

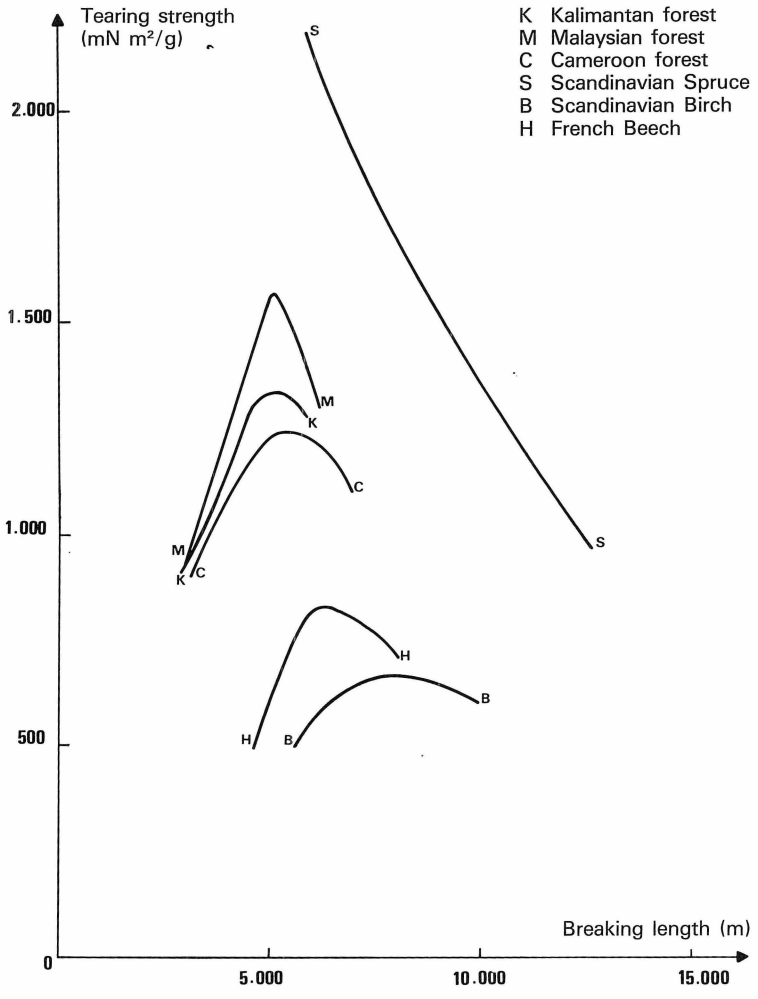
*LABORATORY TESTS*

**a) *On hardwoods from natural forest***

*The laboratory studies on hardwood species taken individually showed a wide range of results similar to those found for other tropical forests. However, it is easy to find out, among this range, the main characteristics of all the woods studied : the latter are characterized by fairly high density and big fiber length.*

*The study of the forest representative mixture was carried out in all the cases. 45 % pulp was obtained in relation to the bone-dry wood, which is an average result.*

GRAPH. — *Tearing = f (Breaking length) of various bleached pulp (from C.T.F.T.).*




*Pulp was bleached easily up to 88-89 with some hydrogen peroxide as the last sequence. The paper obtained from this bleached pulp showed very good tearing characteristics, and was slightly weak as for breaking length. However, if breaking and tearing length are taken into consideration together, this pulp ranks very well, and Malaysian pulp ranks even better than Kalimantan pulp (See Graph 1).*

**b)** ***On softwoods***

*Softwoods are less varied.* Agathis *is of fairly lower quality than Spruce.* Dacrydium *is similar to Landes Pine (maritime pine), with a lower breaking length, but better tearing. The pulp yield from* Dacrydium *is a little low (40 %). Benguet Pine is in between Landes pine and Scots pine, but with higher density than the latter, which is an advantage.*

*TESTS ON A SEMI-INDUSTRIAL SCALE*

*One test only was carried out. It took place in the Cellulose Research Institute of Bandung under the C.T.F.T. control on the East Kalimantan mixture. The results are given in Table 4 : Kalimantan mixture.*

*This trial on a semi-industrial scale confirmed the laboratory studies. The pulp obtained had breaking length and bursting similar to those of Beech pulp, with a much higher tearing. Compared to Beech and Birch, the papers were bulky and porous.*

*For the laboratory tests and the tests on a semi-industrial scale, the soda-sulfur process, well-adapted to hardwoods, was used. For information, the « magnefite » process (solution of true magnesium sulfite) was applied on a Lauan from the Philippines. The results were not as good as with the soda-sulfur or Kraft process.*

*A preliminary economic study carried out by the C.T.F.T. on a base of 200 t/d of Benguet pine bleached pulp, a single cooking line of Pine and hardwoods alternatively (1 month each) on a base of 4.7 $m^3$ per ton of bleached pulp added up to Pesos 720 million in 1975,* i.e. *$ 102 million then.*

*In 1975, the cost of the wood studied by the C.T.F.T. was from 260 to P 300/$m^3$ (1986 : FF 1 = 3 Pesos).*

## *TESTS ON MATERIAL OTHER THAN WOOD*

*Abaca* (Musa textilis) *has been known by Filipinos for a very long time. They are one of the main producers. Abaca yields extremely strong fibers, which are resistant to the action of water and used for the making of fishing nets and ropes.*

*It is suitable for the manufacturing of special papers which require high resistance. Filipinos export small quantities of Abaca pulp.*

*The C.T.F.T. carried out many laboratory studies on this plant and a test on a semi-industrial scale. The tests*

TABLE 4. — KALIMANTAN MIXTURE. RESULTS OF TESTS ON A SEMI-INDUSTRIAL SCALE

| Raw material | Kalimantan mixture | Beech | Birch |
|---|---|---|---|
| Active alkali in $Na_2O$ % | 17 | 15 | 15 |
| Yield % in unbleached pulp (1) | 45 to 46 | 48 | 49 |
| $MnO_4K$ number | 14.2 to 15.3 | 14 to 15 | 14 to 15 |
| Yield % in bleached pulp (1) | 43 to 43.5 | 45.5 | 46.5 |
| CEHH brightness (2) | 72.5 to 79.5 | — | — |
| CEDED (or CEDPD) brightness (2) | 87 to 90 | 88 to 90 | 88 to 90 |
| Characteristics of pulp bleached at 40 °SR (3) : | | | |
| Breaking length (m) | 6,100 | 6,000 | 9,300 |
| Bursting (4) | 33 | 36 | 63 |
| Tearing (4) | 102 | 65 | 63 |
| Bulk | 1.46 | 1.40 | 1.20 |
| Porosity | 20 | 12 | 4 |
| Opacity | 67 | 67 | 55 |

(1) Pulp graded after centricleaners, bone-dry/bone-dry wood. Number of rejects lower than 1 %.
(2) With or without $SO_2$ shower-rinsing. Results given in new standards.
(3) Jokro beating. Sheet formation on kotten. Bleached pulp dried at 90 % dryness.
(4) To change into new standards : Bursting : KPa $m^2/g$ : divide by 10 ; Tearing : mN $m^2/g$ : multiply by 10.

*showed that sodium sulfite process was preferable to soda and sodium sulfur process. In other words, the processes that are little « agressive » are sufficient to obtain high yield pulp (71 to 75 %) which is much paler, easier to bleach and to beat compared to the Kraft process.*

*The test on a semi-industrial scale confirmed these results. Different grades of paper, from writing to air-mail, were manufactured without any difficulty. The application of the sulfite process should be studied on the whole plant, as the studies were essentially carried out on the textile fiber and the carding waste.*

## RANK OF ASEAN COUNTRIES' PULP AMONG TROPICAL PULP

*Compared to the tropical pulps studied by the C.T.F.T., pulp from Kalimantan and Malaysian hardwoods offer some similarity, although they have more marked characteristics, Malaysian pulp even more so than Kalimantan pulp. They have indeed higher values for tearing at similar breaking length (See Table 5).*

*They even have higher values than Cameroon wood which already had that characteristic. As the test on semi-industrial scale confirmed this result, the latter can be considered as definite. This pulp also has high porosity and bulk, grades which are indeed well correlated with tearing.*

*All these attractive qualities make the pulp suitable for the manufacturing of writing paper as well as special paper, except for highly resistant paper,* e.g. *wrapping paper. For that grade, the pulp from softwoods from these regions possesses all the required qualities. For other very strong kinds of paper,* e.g. *banknotes..., Abaca may be used, if its profitability can be demonstrated.*

## CONCLUSION

*The launching and development of a pulp and paper industry in the South East Asian tropical areas aroused deep interest in the seventies and until 1982.*

*In 1979, a FAO report mentioned that the best locations for implanting new manufacturing centers for pulp and paper were North Sumatra, North East and*

TABLE 5. — MALAYSIAN MIXTURE. RESULTS OF LABORATORY TESTS

| Raw material | Malaysian mixture | Beech | Birch |
|---|---|---|---|
| Active alkali in $Na_2O$ % | 17.05 | 15 | 15 |
| Yield % in unbleached pulp | | | |
| 50 l digester | 45.1 | 48 | 49 |
| 2 l bomb | 45.3 | | |
| $MnO_4K$ number | | | |
| 50 l digester | 21.6 | 14 to 15 | 14 to 15 |
| 2 l bomb | 21.4 | | |
| Brightness CEDED (1) | 87 | 88 to 90 | 88 to 90 |
| CEDPD (1) | 89 | | |
| Characteristics of pulp bleached at 40 °SR (2) : | | | |
| Breaking lentgh (m) | 6,700 | 6,000 | 9,300 |
| Bursting (KPa $m^2/g$) | 4.2 | 36 (3) | 63 (3) |
| Tearing (mN $m^2/g$) | 1,500 | 65 (4) | 63 (4) |
| Bulk | 1.34 | 1.40 | 1.20 |
| Porosity | 15 | 12 | 4 |
| Opacity | 64 | 67 | 55 |

(1) On 50 l digester pulp.
(2) Jokro beating. Sheet formation on Kotten. Bleached pulp not dried. Digester and bomb give very similar results.
(3) Divide by 10.
(4) Multiply by 10.

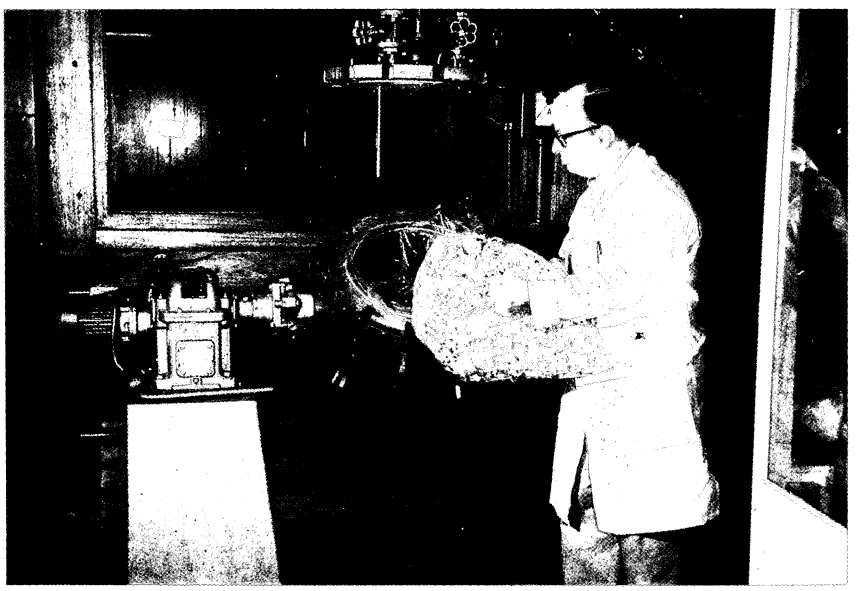


Photo C.T.F.T.

*Lessiveur rotatif.*
Rotating digester.

*South Kalimantan ; Java was excluded for economic reasons.*

*The studies that were carried out still retain their practical interest.*

*To guarantee wood supplies and reduce the risk of ecological damage brought about by deforestation, the important industrial projects should however integrate plantation programs of fast growing species on at least 40 to 50,000 hectares over twenty years or so.*

*In this respect, East Asia is particularly favored as Eucalyptus, for one, is present in big natural stands in the Sunda islands, with urophylla and deglupta species especially. Eucalyptus urophylla, introduced in Africa, in the People's Republic of Congo, showed its excellent compatibility with the paper qualities required from pulp for the international market and it is still being improved in its implantation area. Eucalyptus deglupta is a fine paper species, even though its density is poor.*

*In Sabah,* Acacia mangium *is being planted. This species might be a promising species for pulp yield.*

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