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THE ROLE OF MINERAL RESEARCH INSTITUTES OF DEVELOPING COUNTRIES IN PROMOTING EXPLOITATION OF KAOLIN AND INTERNATIONAL COOPERATION*

by

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785

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THE ROLE OF MINERAL RESEARCH INSTITUTES OF DEVELOPING COUNTRIES IN PROMOTING EXPLOITATION OF KAOLIN AND INTERNATIONAL COOPERATION

INTRODUCTION

Most of mineral research institutes in developing countries play a very important role in promoting exploitation of home mineral resources and international technic cooperation. But compared with developed countries, their major stumbling blocks include lack of fund, modern testing equipment and technological experts.

This paper will introduce some informations of mineral research institutes in China. Since China is one of the developing countries, the paper will also reflect a picture about the role and the problems of mineral research institutes in developing countries.

The mineral research institutes in China concerning exploitation of Kaolin are described in Table 1.

Table 1: The mineral research institutes in China for kaolin

Name	City	Members	R. resoults	Equipment
Suzhou D & R Institute of Non-metallic Mineral ind.	Suzhou	132	Bleach, new method of deposit evaluation	Polarization microscope, electronic microscope, differential thermal analyzer, spectrophotometer
Xian Yang Non-metallic Mimeral R. Institute	Xian Yang	72	Slurry formula Mining method	Whiteness meter electronic microscope

(continued)

R. Institute of China kaolin Co.	Suzhou	21	coating grade kaolin, calcined kaolin	Polarization minroscope electronic microscope differential thermal analyzer, spectrophotometer
Bureau of Jiangsu Geology Mineral Resources	Nan Jing	800	Regulation of kaolin explor-ation	Topographic mapper, electronic microscope
Geology Test Centre of Zhejiang Province	Hang zhou	15	Delaminated kaolin.	Polarization microscope electronic microscope differential thermal analyzer, spectrophotometer
Mineral R. of Wuhan University of Techno.	Wuhan	25	Bleach	Electronic microscope whiteness meter Viscosity meter

ROLE OF MINERAL RESEARCH INSTITUTES IN EXPLOITATION OF KAOLIN

In recent years, many research programs in exploitation of kaolin have been done by the mineral research institues of China. Although lack of fund, modern laboratory equipment, certain results have been achieved to meet the necessary quality standards of various industries, and some imported products have been replaced by home made processed products to save many foreign exchange. The issue of regulation on kaolin exploration, the new method of deposit evluation and the completed design project of Guanshan kaolin mine and washing plant were also reflected the role of mineral research institutes. Their major results are introduced as follows:

1. The Regulation of China kaolin Exploration

Kaolin not only was used first in China but also the name of kaolin is derived from the China. But until 1986 China has its own kaolin exploration regulation instituted by the Bureau of Jiangsu Geology Mineral Resource. This regulation was based on the great investigation materials from domeslic and abroad. It is also a conclusion of many years experienec of kaolin exploration and mine construction in China. Table 2 shows the deposit types of exploration.

Table 2: Depopist types of exploration

Types	Ore body shape	Structrue	Size of deposit	
			Res. 10 Thou. T	Area Km^2
1	Tabular, regular	stable with little matrax	> 2000	> 0.5
2	Tabutar and lenses little irregular	"	500 - 2000	> 0.2
3	Lenses irregular	stable with some matrax	100 - 500	> 0.07
4	Discontinuous irregular	unstable with lot of matrax	< 100	< 0.03

Note: ^2 = square

The pattern of exploration for grade B, C, D are described in Table 3 table 3

Types	Space (metre) of exploration engineering					
	Grade B		Grade C		Grade D	
	along strike	along decline	along strike	along decline	along strike	along decline
1	100	100	200	100 - 200		
2	50 - 100	50	100	100		
3			50 - 100	50		
4					50	50

With the publication of kaolin exploration regulation, the requirements of kaolin exploration engineering have a uniform standard, which plays very important role for promoting exploitation of kaolin.

2. Calcined Kaolin

The natural kaolin contains many ferruginous coloring compounds reducing its application valve in processing industries. By the way of calcination, the harmful impurities will be removed. When kaolin is heated at approximately 550 degres centigrade. The crystal structiore is destroyed and converted to semi-crystal metakaolin, which can be used as an agent for improving electric properties of cable PVC. Since the calcined kaolin is whiter, brighter and has better hiding properties, it also can be used in paper industry.

The two types of Suzhou kaolin E and W were tested by the Research Institute of China Kaolin Co. (CKC). Fig.1 shows the relation between heating temperature and PV20 (electric resistance)

The Fig. 1, indicated that the temperature of kaolin crystal coverting and the temperatrue of maximun electric resistance PV2Q are different with various types of kaolin. The crystal converting temperature in 400 and 500 degrees centigrade and the maximum electric resistance temperature is 600 and 700 degrees centigrade for kaolin type E and W respectivly. When the temperature upto 900 degrees centigrade, the electric resistance parameters of the two types kaolin have no any improvment.

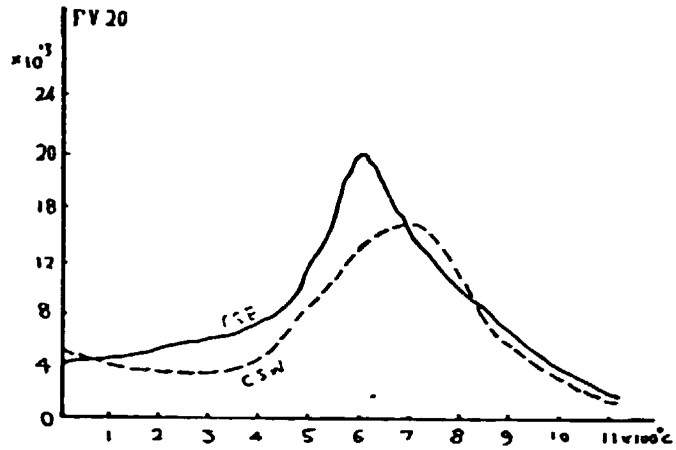


Fig. 1 The relation between heating temperature and PV20

So the conclusion is that for improving electric properties of cable PVC, the heating temperature of Suzhou Kaolin should not be higher than 800 degrees centigrade and lower than 500 degrees centigrade.

The technology of calcined kaolin in developed countries are generally using advinced dynamic air heating. Because lack of fund and equipment, the Research Institutes of China Kaolin Co. using static air heating and surface-modify technology to produce calcined kaolin. These surface-modified kaolin can be hydrophilic, hydrophobic, or organophilic. The sillicone oil is used as a surface-modify agent.

The major flowsheet is as follows:

Crude kaolin ---- washing and separation ---- filter press ---- fine partical (325 mesh) ---- static air heating to 500 - 800 degrees centigrade for 20 - 50 hours ---- pulverizer ---- surface modify ---- package.

The quality comparison between Suzhou calcined kaolin and foreign calcined kaolin are shown in Table 4.

Table 4

Items	Origenal electronic resistance	foreign calcined kaolin			domcric calcined kaolin	
		SP - 33 (US)	BWRGTSS #30 (US)	M 501 (U K)	Suzhou grade I	Suzhou grade II
PV20	1.40x10	4.34x10	3.74x10	6.36x10	2.28x10	1.53x10
Increase times	0	2.1	1.7	35	15	9.9

The Table 4 shows that the quality of domesic calcined koalin is much better than foreign calcined koalin and the price is only a half of the import products.

3. Delamination Processing

The high press delamination precess was researched by Geology Testing Centre of Zhejing Province.

The principle of high press delamination is that when kaolin slurry under a press of around 600 kilogramme per spuare centimetre, and at a speed of 950 meters /sec passing through a narrow gap injects to a turbine at ordinary press, the slurry suddenly reduces its presure, which produces an impact force combined with shear force to lead the kaolin crystals spliting along its weak plates surface.

The principal flowsheet is as follows: The kaolin slurry under 350 mesh --- hydrocyclones separatting -20 u particles --- centrifuges separatting -2 u at 80% for coating products. The residual slurry with particle size between 2 u to 20 u are delaminated and the Table 5 shows its results.

Table 5 indicated that before delamination -2 u contains 18%, -6 u contains 44.7% , surface area is 80745 spuare centimetre per gramme; after once delamination the -2 u contains 37%, -6 u contains 95.6% , surface area is 24500 spuare centimetre per gramme.

Table 5 Comparison of paritcle distribution before and after delamination

Before delamination		After delamination	
Particle u	Cumulative rate	particle u	Cumulative rate
0 - 0.2	0.15	0 - 0.2	2.38
0.2 - 0.5	2.37	0.2 - 0.5	17.1
0.5 - 1.0	7.67	0.5 - 1.0	30.0
1 - 2	18.0	1.0 - 2.0	37.0
2 - 4	29.9	2.0 - 3.0	59.0
4 - 6	44.7	3.0 - 4.0	75.0
6 - 8	66.5	4.0 - 5.0	88.1
8 - 10	83.3	5.0 - 6.0	95.6
10 - 12	91.1	6.0 - 7.0	97.4
12 - 14	94.1	7.0 - 8.0	99.2
14 - 16	97.1	8.0 -10.0	100.0
16 - 18	98.8		
18 - 20	100.0		
Average in 50% :	6.48 u	Average in 50% :	2.59 u
ratio of surface:	8074.5	ratio of surface:	24500

Using micron photosizer SKC-200R bY Long Taifen

The comprison of whitness and viscosity by using centrifuges and delamination are discributed in Table 6.

Table 6 Comparison of centrifuges and delamination

Centrifuges		Delamination	
Solid %	Viscosity	Solid %	Viscosity
50	40	55	50
55	120	58	100
57	300	62	105
58	1050	65	600
60	2600		
Whiteness	81	whiteness	86.4
Brightness	84.7	Brightness	89.1

4. High Quality Coating Clay

In order to meet the requirements of paper industry , the Research Institute of China kaolin Co. using sodium silicate dispersant chemical, hydrosulfite electrovalence and polyacrylamide selective flocculation chemical produces high quality coating clay to replace import procucts. By this way about 18 to 20 million US dallors were saved for each year.

The principal beneficiation steps are shown in Fig. 2 The crude kaolin are conveyed into a blunger, which disperses it in water with the aid of a dispersant chemical to form a clay-water slurry. The dosing of dispersant chemical about 0.4% of slurry in certain pH. Then selective flocculation chemical is added to separate pyrit, quize and alunite. The another selective flocculation chemical is added into the residual slurry to remove fine sand and other impulities , then adding flocculation chemical to get flocculated kaolin slip, which are dewatered by using filter presses. The filted kaolin cake is the high quality coating clay with moisture about 35%

The quality comparison of coating clay among china, USA and UK are disributed in Table 7 which shows the quality of Suzhou coating clay is very near the KCS (USA) and SPS (UK) coating clay.

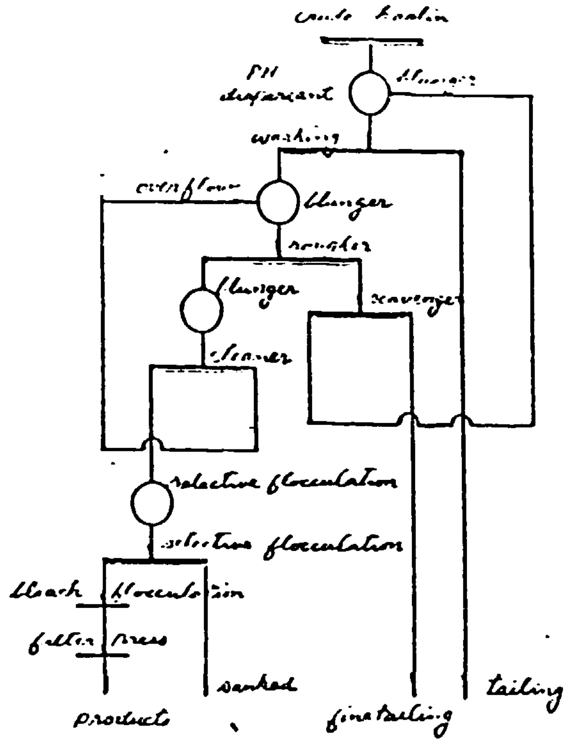


Fig.2 Flowsheet of high quality coating clay

Table 7 Quality comparison of coating clay

Item	Chemical compocition							physics			
Mark	SIO2	AL2O3	FE2O3	TIO2	K2O	NA2O	LOSS	BRI.	-2U	=53U	VISCO.
ASTRA-USA	45.3	38,38	0.3	1.44	.04	.27	13.9	89 %	85	.005	400
KCS -USA	45.3	38.38	0.3	1.44	.04	.27	13.9	89 %	85	.005	200
DINKIEA	47.8	37.00	.58	0.03	1.1	.10	13.1	85 %	75	.02	72
SPS-ECC	47.8	37.00	.58	0.03	1.1	.10	13.1	85 %	80	.02	69
GUANSHAN	43.0	38.70	.29	0.20	.29	.12	15.4	85 %	89	.005	69

5. A New Method of Evaluation Deposits

Nowadays , a common used method of investmint risk analysis in west countries is the Monte Caralo simulation technic. It requares many data information and certain probabilty destrubution for each input variable.

Because of lack of statistics and probability distribution material in depcsits evaluation it is limited to use Monte Carlo apprech in China. At present, decision making under uncertainty analysis in project apprisal still stays in sensitivty analysis level without quantity and risk analysis. In order to improve this stuation, a new methord of investment risk analysis called Sum of Deveiation was developed by author.

1) The theory of Sum of Deviation

The common used three distribution types in Monte Carlo approch are shown in Fig.3. Since the trigonal distribution only needs three points: low limit, expect value and up limit, to determine the character of probabity destribution, it is very simple. Fig.3 indicats that the area under the trigonal probability density function are samular that of other two probability density fuctions distribution and are no apprarent difference for the final calulating resoults, cumulative probabilistic curve. So for sinplicity only the trigonal distrilution is used in the new method.

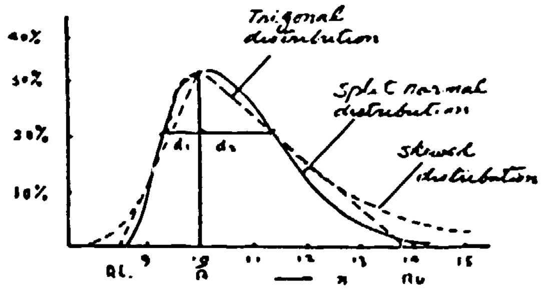


Fig. 3 The common used three distribution

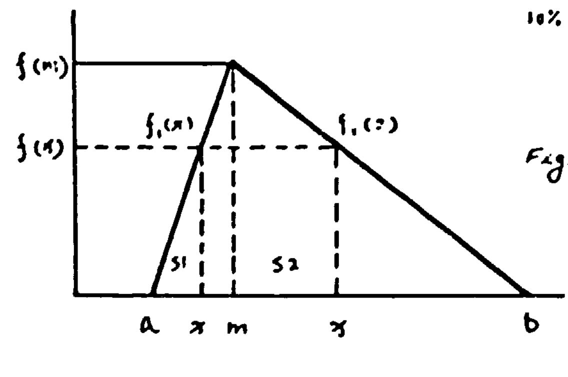


Fig.4. Character of Trigonal distribution

Fig. 4 shows the analysis of a triginal distribution character. The density functions of trigonal distribution are as follows:

$$f1(x)=\frac{2(x-a)}{(b-a)(m-a)} \qquad a<=x<m$$

where:
m ---- expected value
a ----- low limit
b ----- up limit

$$f2(x)=\frac{2(b-x)}{(b-a)(b-m)} \qquad m<=x<b$$

$$f(m)=\frac{2}{(b-a)} \qquad x=m$$

$$F1(x)=\int_a^x \frac{2(t-a)}{(b-a)(m-a)}dt=\frac{(x-a)^2}{(b-a)(m-a)} \qquad a<=x<m$$

$$F(x)=\int_m^x \frac{2(b-t)}{(b-a)(b-m)}dt+\frac{(m-a)}{(b-a)}$$

$$=\frac{(x-b)^2-(b-m)^2}{(b-a)(m-a)}+\frac{(m-a)}{(b-a)} \qquad a<=x<b$$

In the above formula, F1(x), F(x) are the cumulating probability functions when x between a and b .

Based on the principle of Sum of Independet Randem Variabless: "the overall expected value is the sum of each expected value of random variables; the overall variance is the sum of each variance of independent random variable." It is assumed that xpected D.C.F. (rate of discounted cash flow) R is a functions of all expected values of project parameters: A, B, C. If each of input parameters is Changed from low limit to up limit by turn and other parameters are using their expected values, the computed up and low variances of D.C.F. for each changed parameter will be aud^2, ald^2, bud^2, bld^2, cud^2, cid^2.

Because the result from dalculating the low or up limit of one parameter with expected values of other parameters maybe the up or low variance respectively , so the calculated results should compare with the expected D.C.F. to determine whether it is up or low limit veriance, and to get the overall up and low variance as follows:

$$ru^2 = aud^2 + bud^2 + cud^2 + \text{-------}$$

$$rl^2 = ald^2 + bld^2 + cld^2 + \text{-------}$$

the overall up and low standard deviation of D.C.F will be as follows:

$$ru = \sqrt{aud^2 + bud^2 + cud^2 + \text{-----}}$$

$$rl = \sqrt{cld^2 + cld^2 + cld^2 + \text{-----}}$$

Then the up limit and low limit of overall expected D.C.F. will be Ru=R (expected D.C.F.) + ru and Rl=R(expected D.C.F)- rl respectively.

For the consideration of influence between the project prarmeters, based on the mathematical relationships of trogonomety, $C^2=A^2+B^2-2\cos\theta$, the Sum of Deviation Mathod sets up a relationship parameter K, and makes $K=2\cos Q$. For independent variables their angle between two vactors is 90 degrees, $\cos Q=0$, $K=0$, $C^2=A^2+B^2$. It is complety correspondening to the formula of Sum of Indepent randem varables. For the medium multiplus variables their angle between two vactors is 135 degrees, $K=2\cos 135=-1.4$, $C^2=A^2+B^2+1.4AB$. For the medium multimanus variables their angles between two vactors is 45 degrees, $K=2\cos 45=1.4$, $C^2==A^2+B^2-1.4AB$. As the above, for the strong multiplus and multimanus varibles their angles between two vactors will be 180 and 0 degree, $K=-2$ and 2, $C^2=A^2+B^2+2AB$ and $C^2=A^2+B^2-2AB$ respectively.

The K will vary from -2 to 2. In practice, the K can be computed by 2 time the ratio of increase and decrease of the two relevent variables. So the formula of overall standard deviation should be:

$$ru = \sqrt{aud^2+bud^2+cud^2+\text{------}k1*aud*bud-k2*bud*cud}$$

$$rl = \sqrt{ald^2+bld^2+cld^2+\text{------}K1*ald*bld-K2*bld*cld}$$

2) Case Study

The Guanahan Kaolin Depesit of China Kaolin Clay Co. is the largest and best kaolin depsit having been discovered in China until now. It was found near Suzhou city, Jiangsu Province, about 5 km away from Suzhou West Railway Station.

The deposit average thickness is 30 m and the largest is 90 m. The dip angle is about 30 degrees in direction of northwest 230 degrees, as showen in Fig. 5. Table 8 shows ore types, chamical composition and reserves.

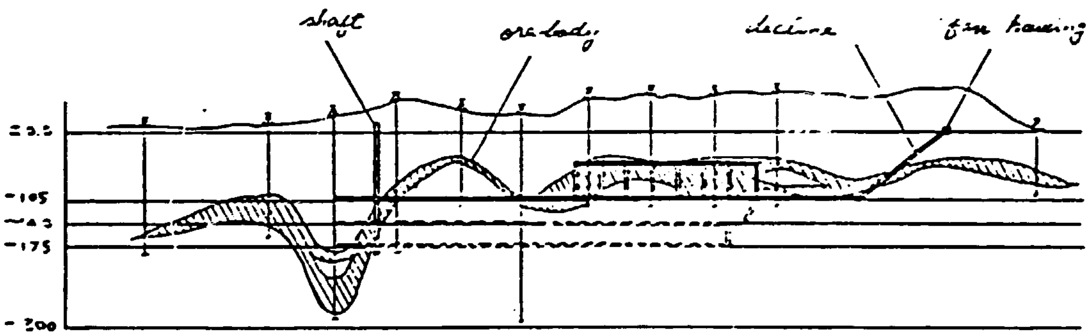


Fig 5 Developing System of Guanahan Kaolin Mine Longitudinal Section

Table 8, Ore types, chemical composition & reserves rate

\ Type comp. \	Ordinary 1 gr.	2 gr.	contains alunite 3 grade	cotains alunit & iron 4 grade
SiO_2	<51	< 55	< 52	< 65
Al_2O_3	> 34	>28	> 34	> 24
Fe_2O_3+	< 1.2	<3.5	<1.5	<1.5 - 4.0
TsO_2	< 1.0	<2.0		<7
SO_3			< 4.0	
rese. rate	13 %	28 %	6.8 %	51.9 %

Its total reserves is about 40 million tons; the ore natural whiteness is 70-82 % compared with $BaSO_4$; refractoriness is >1770 degrees Centigrade.

A report of feasbility study and a primary design for Guanshan Kaolin Mine and Processing Plant were issued by Suzhou Design and Research Institute of Non-metallic Mineral Industry in 1986.

The capacity of the mine will be 200 thusand tpy. The shaft and decline developing system and top slicing mining method are used with level space of 35 m, jack hammer, hand mucking and haulage. The shafe diameter is 5m extending 170m in deep, and a ventilation fun is located at the outside end of de[illegible]ne. Fig.5 is a longitudinal section of the developing system along with the strick of ore body.

The processing capacity of raw material and products is 150 thousand tpy and 94.3 thousand tpy respectively. The processing steps are as follows: crude ore is crushed by tooth roll crusher---making slurry of 25% solids by washing maching, ball mill, spiral separater and adding dispersing chemical --- hydrocyclones (first cleaner) --- hydrocyclones (second cleaner) --- centrifugal separation (third cleaner) --- adding selective flocculation chemical to separate alunite (fourth clearn). Fig.6 shows the flowsheet. The technical standards of proucts are shown in Table 9.

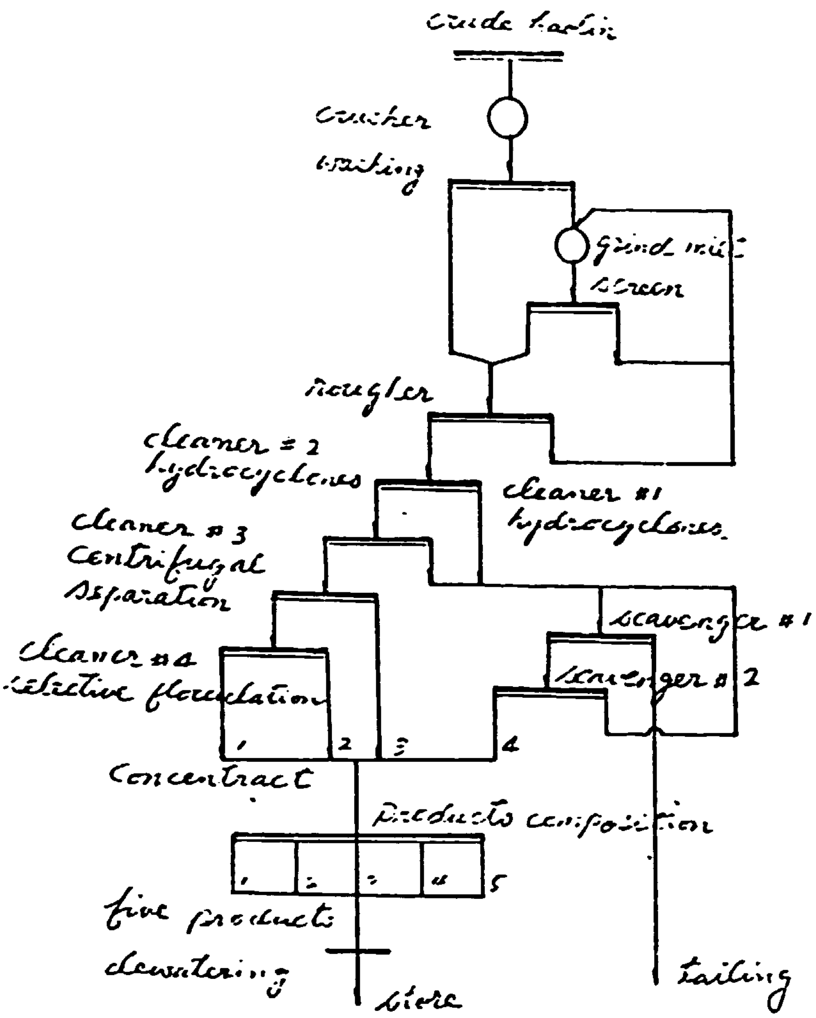


Fig. 6 Flowsheet of Guanshan kaolin washing plant

Table 9 products quality standerds

\ item / prod. \	chemical compostion					physical character					
	Sio2	Al2o3	Fe2o3	Nao2	bri.	+44u	-2u	Vis.	dry	Wet	used for
No. 1		>37 %	<.5 %		83 %	.02%	85%	1000	15%	37%	coating
No. 2		>36 %	<.5 %		83 %	<.5%	75%		15%	37%	coating
No. 3	<49%	>36 %	<.8 %						15%		pertro.
No. 4	<48%	>37 %	<.4 %	<.5%	80 %	<.5%	<.5%		15%		el. cer.
No. 5	<50%	>30 %			80 %	1.0%			15%		rubble

By means of CASIO/PB-700 computer the new method was used in the investment risk analysis of Guanshan kaolin project. The main input data are as follows:

1) The project parameters: investment cash flow, production quantity, tax, and running cash by years.

2) Servicing years: 24.

3) Tax ratio: 8% of sales incomes.

4) Relative parameters between cost and investment: K1=1.4

5) Relative parameters between production quantity and investment: K2=1.17

6) Relative parameters between production quantity and cost: K3=1.65

7) The up limit, low limit and expected values of four major project parameters: investment, cost, prices and production quantity are shown in Table 10.

Table 10. Input parameters

Item	low limit	expected value	up limit
Cost	10.77 m. ypy	11.97 m. ypy	14.37 m. ypy
Price	302 ypt	335 ypt	403 ypt
Invest.	16.74 m. ypy	20.93 m. ypy	25.11 m. ypy
Pro.qu.	82,000 tpy	102,000 tpy	123,000 tpy

Data input are using dialog method between computer and operater. So it is very easy to learn and master. Thirty minits after data input, the computer will automatically output the figures of cash flows, sensitive analysis, density probability of D.C.F, cumulated probability of D.C.F. and table of D.C.F. calculation. Fig.7 shows the yearly cash flow. the curve of CNCF (cumulate net cash flow) across the zero line at point 9.5 year, which indicates the pay back period is 9.5 years. The lowest point of the CNCF curve indicates the figure of total investment.

Fig. 8 shows a distribution of DCF probability density. Fig. 9 shows a cumulated distribution of DCF which indicates:

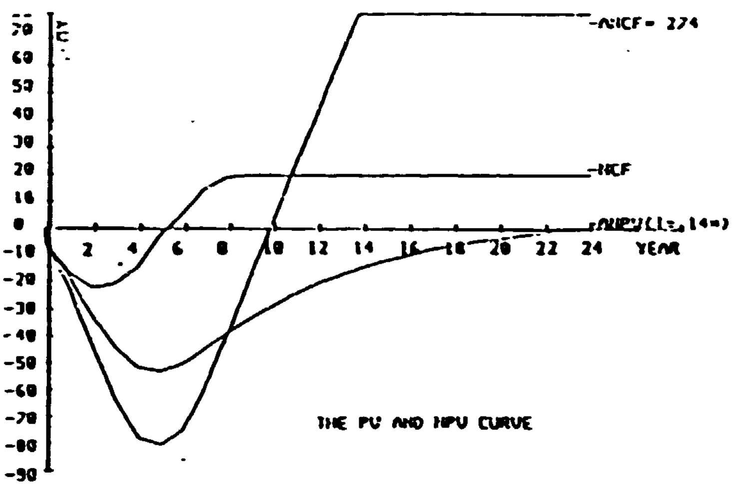


Fig.7

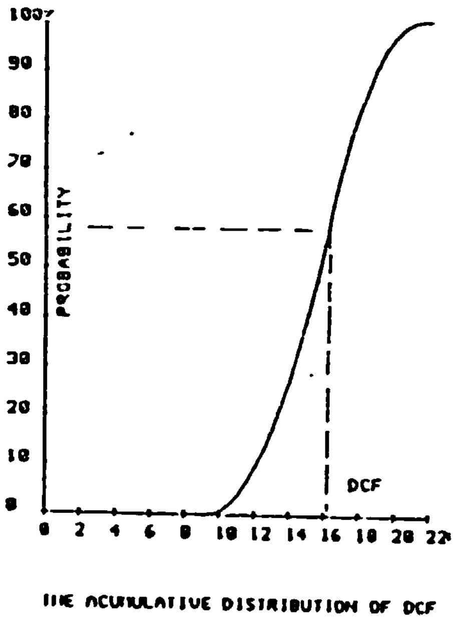


Fig.9

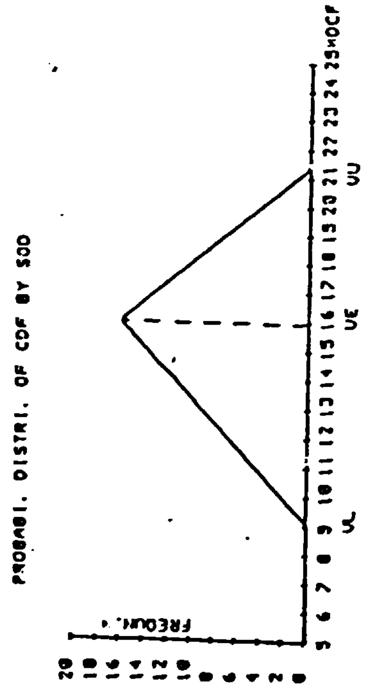


Fig. 8

1) The possibility of DCF between 10% TO 16.9% is 58 %; between 16.9% to 22% is 42%

2) The possibility of DCF lower than bank interest rate 7.2 % is zero.

So, the investment effects of Guanshan kaolin project is good and the project is feasible.

The achievements of mineral research institutes in China introduced in foregoing paragraphs, prove that although lack of fund, modern testing equipment and experts, the mineral research institue in the developing countries still can play a certain role in promoting exploitation of kaolin.

ROLE OF MINERAL RESEARCH INSTITUTES IN TECHNIC COOPERATION WITH FOREIGN COUNTRIES

The technic cooperation between mineral research institutes and foreign countries usually has four forms such as cooperation with United Nations, to join or organize international conferences, to join foreign engineering projects and technic visit.

1. Cooperation With United Nations

The Chinese government with UNDP and UNIDO has a agreement to set up a "Non-metallic Mineral Development Centre" in Suzhou Design and Research Institute. The main jobs of the "Centre" is research, exploitation and disseminating application of non-metallic minerals. The fund from UNDP are mainly used in purchasing labratory equipment, inviting foreign experts to China and Chinese experts to abroad, training technicians in abroad. Now this agreement is going on.

2. To Join and Organize International Conferences

In reset years, mineral research institutes in China have a lot of opportunities to join the internation conferences on non-metallic minerals, such as Sixth World Industrial Minerals Conference in 1984, at Toronto, Canada; Frist World Non-metallic Minerals Conference in 1985, at

Belgrade, Yagoslavia; Non-metallic Minerals application vorhshop of developing countries in 1985, 1988, at Bilson, Czechoslovakia. In addition, China accompanied vith UNIDO, "Industrial Mineral" and other foreign organizations vill sponsor the Second World Non-metallic Minerals Congress in September 1989, Bejing. These conferences not only provied opportunities to learn from each other but also promote friendship between the counterparts in the non-metallic minerals world.

3. To Join Foreign Projects

The Suzhou Design and Research Institute of Non-metallic Mineral Industry has joined construction of kaolin mines and washing plants in Viet Nam and Algeria. In the early of this year the institute bids for designing Nagar Parker Kaolin Mine and Washing Plant in Pakistan. The mine is located 550 Km southest Kasachi with 3.6 million tonnes proved reserves. The washing plant is aimed to install a 40,000 tpy capacity of raw kaolin. In addition to China, USA,UK,West Germany,Czechoslovakia also bid for this project. Although compared with other developed countries China is weak in advinced technology. But the equipment from China are durable, cheap and easy to operate, maitain and meet the reguirements of developing countries.

4. Technical Visit

In the resent years, many Chinese experts from mineral research institutes alway visit foreign countries for negociation about joint venture or purchasing equipment. At the meatime the experts and businessmen from foreign countries also come to China. This activities are very helpful for promoting technology development. For example. A British clay processing professor Dr. Hery Cohen from Landen University suggested using selective flocculation to remove alunite from Suzhou kaolin, when visiting China Kolin Co. in 1984. One year later his suggestion had promoted the success of making hegh quality coating clay in the China Kaolin Co.

THE PROBLEMS OF MINERAL RESEARCH INSTITUTE IN DEVELOPING COUNTRIES

Although this artical introduce some archievements and works of kaolin exploitation in China, some of these informations also can reflect the common problems of mineral research institute in developing countries such as:

1. Some developing countries rich in good quality kaolin, since lack of fund, laboratory equipment, exports their mineral research institutes can not produce high quality processed kaolin products. They have to exports their raw materials and import processed products from developed countries.

For example, only the Nagar Parker Kaolin Mines in Pakistan has proved resecrves about 3.6 m tons. Its recovery rate of kaolin from 240 mesh product is high at 88 - 95% and brightness is 81 - 82% compared with Baso 4. But Pakistan still import kaolin 4,500 - 5,600 tpy, (from "Industral Minerals July 1987).

2. Although based on the behavior of dormestic raw material and their conditions of laboratory equipment the mineral research institutes in developing countries can produce some high quality products like calcined kaolin and coating grade clay in China, usually their production scale is samll, quality is unstable, cost is high, labor condition is poor and products have no competitive power in the world market.

3. Lack of foreign exchange to purchase modern laboratory equipment, to train people in abroad and to employ foreign experts.

4. By the view of commercial profit, developed countries usually keep technic knowhow secret to the developing countries. For example, some important kaolin companies in western countries, they do not accept training and technic visit programme from developing countries.

Because the existing of world free market on raw materials, in spite of you well or not, we must submit the fact, that all raw materials supplying and processing , saling and buying countries are put into an international system. In this system a competition is taken under the conditions of equal price and quality. But in fact it is a competition of processing technic power rather than price and quality. In general, the developing countries were always set in a weak position in this competition system due to their poor conditions of mineral research. But developing countries can release these problems , if they can adrop some effective international measures. for exemple under the aid of United Nation, the 77 group countries can set up an International Minerals Research Centre (IMRC) equapted with latest equapment of laboratory and ploit plant.

The IMRC maybe only serves for member countries and consists of four main departments:

1. Department of technic information, which job is to publish a journal introducing: the latest development in raw material exploitation and processing technology; the technic problems; world market analysis; possible cooperation projects between the member countries.

2. Department of consultant, which jobs including: technic consultant; design or feasibility study for engineering projects; advicing training programme.

3. Department of laboratory, which job including: raw material processing test for the member countries; research new processing technology; accepting training programme.

4. Department of world market, which job including: forecasting market tendency and making decision for uniform reaction of member countries.

We belive IMRC will improve the conditions of mineral research institutes of developing countries and help raw material export countries strength their competitive power in the world free market.

1988.7.2

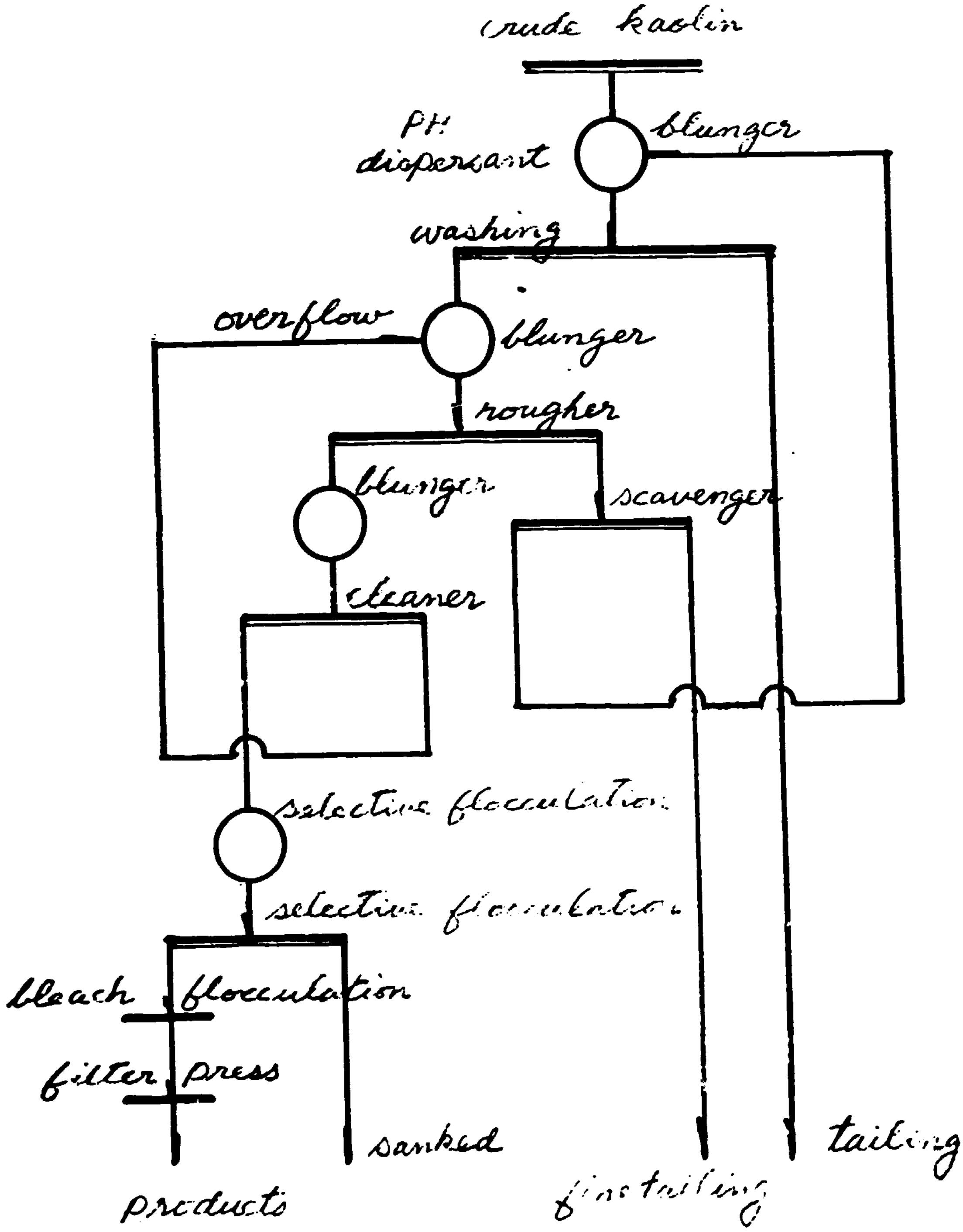


Fig.2 Flowsheet of high quality coating clay

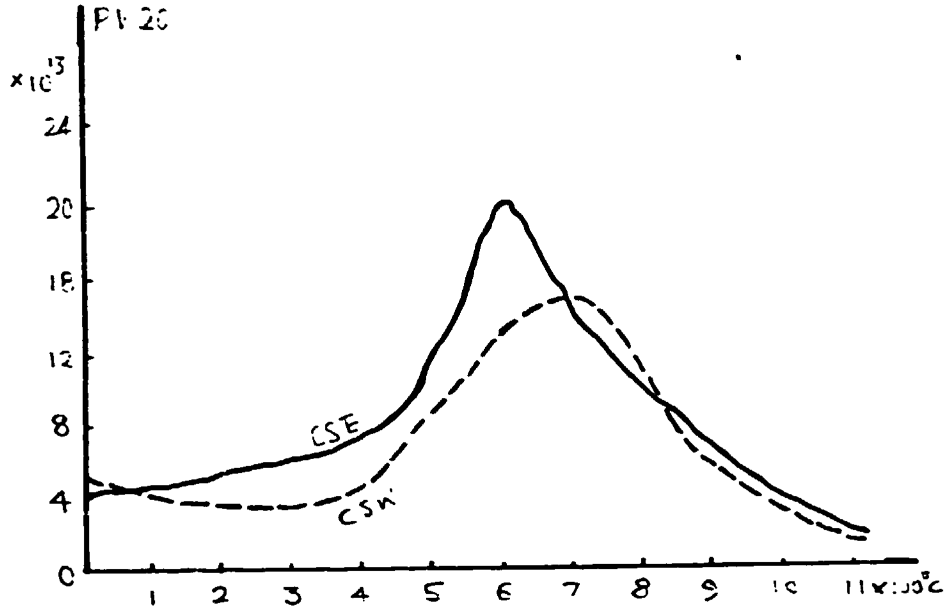


FIG. 1 The relation between heating temperature and Pi-20

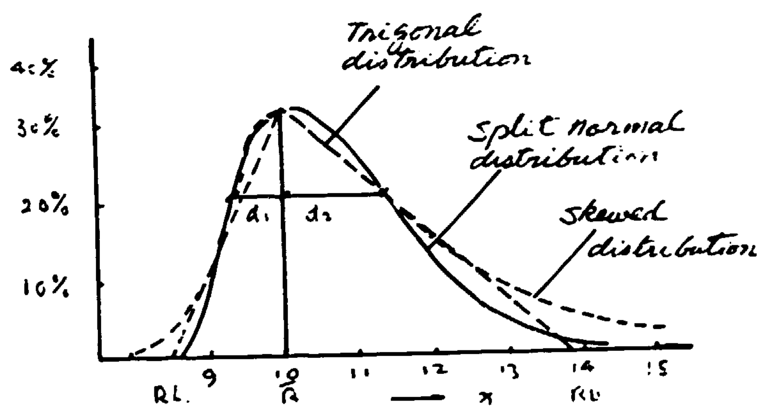


Fig. 3 The common used three distribution

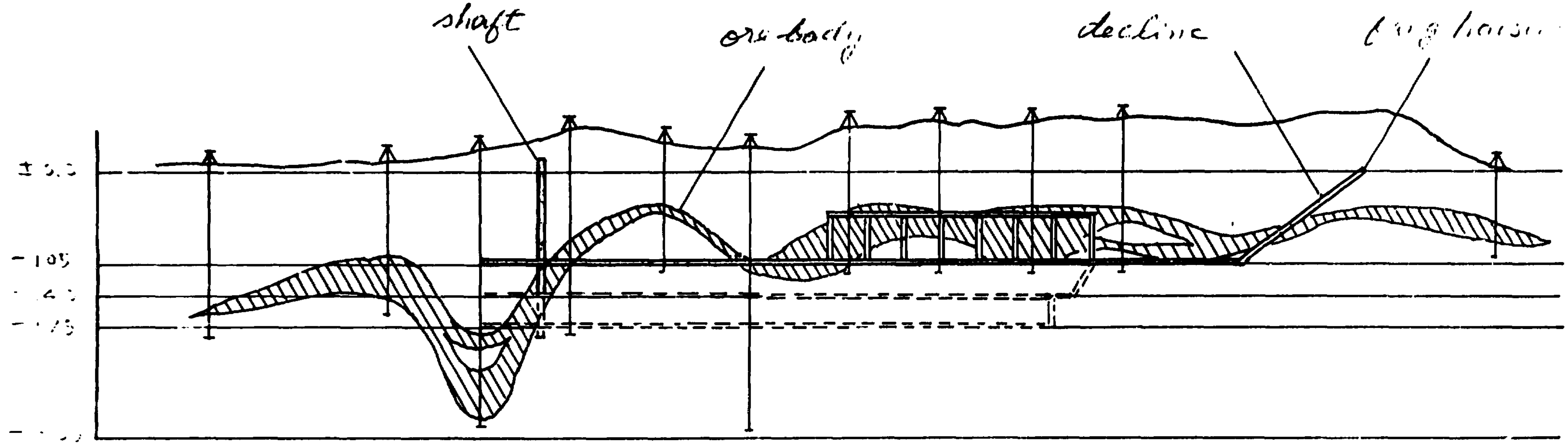


Fig. 5 Developing System of Guanshan Kaolin II

Longitudinal Section

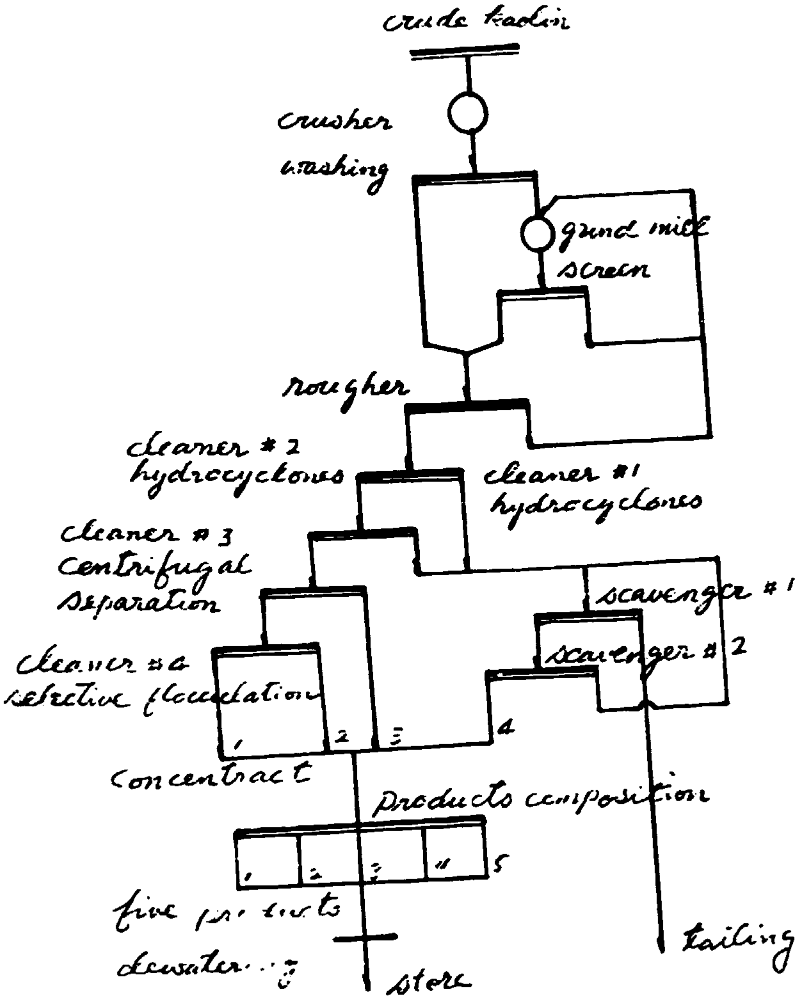


Fig 6 Flow-sheet of Guanshan kaolin washing plant

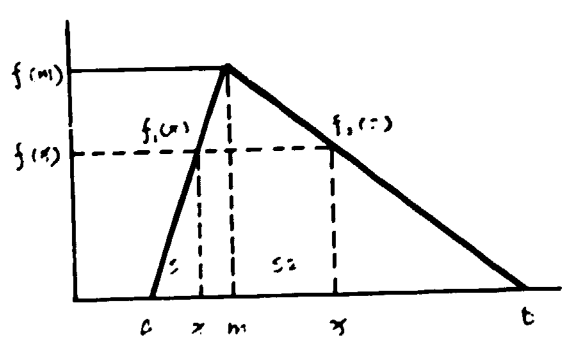
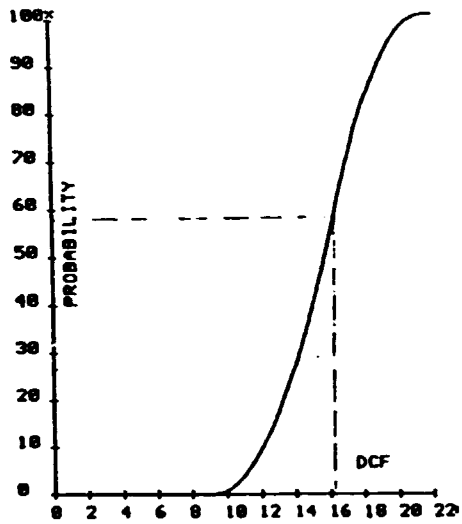


Fig. 4 Character of trigonal distribution



THE ACUMULATIVE DISTRIBUTION OF DCF

F.g 9

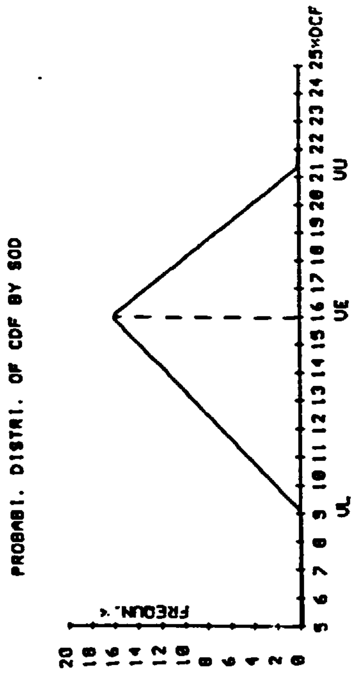


Fig. 8

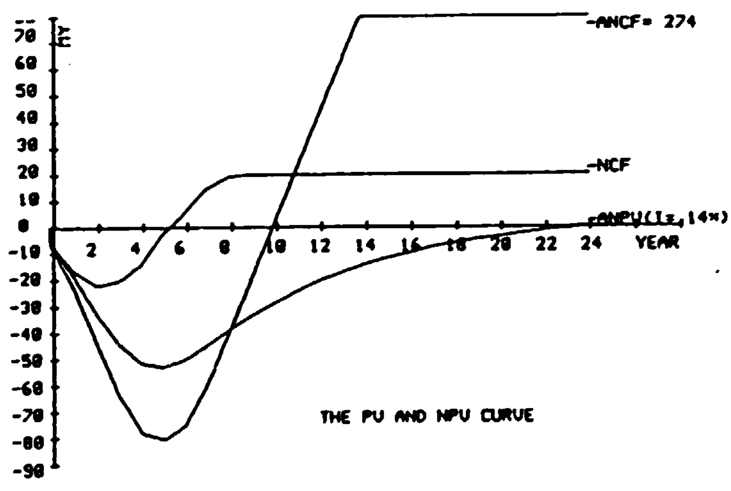


Fig. 9

These figures are output from CASIC-PP.700 Computer