

DOING
Henan Doing

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DOING 棕榈
Doing Palm Oil Mill Manual

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AND FAT MACHINERY

河南东盈机械设备有限公司
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河南东盈

目录 Contents

1. 公司简介 Company Profile	01
2. 公司结构 Company Department	03
3. 业务介绍 Business Scope	04
4. 棕榈概况 Palm Fruit Introduction	05
5. 棕榈油成套设备 Palm Oil Processing Equipment	09
6. 毛油精炼分提设备 Refinery & Fractionation Equipment	23
7. 加工实力 Manufacturing Ability	31
8. 客户来访 Customer Visit	33
9. 项目案例 Project Case	35
10. 发货现场 Delivery	37
11. 公司证书 Certificate	39

公司简介

COMPANY PROFILE

河南东盈机械设备有限公司位于河南省郑州市，是一家集研发，设计，设备制造与安装，工程承包，技术服务，国际贸易等为一体的专业公司，公司业务涉及粮油设备，轮胎炼油设备，木薯淀粉和糖浆设备。

公司具备较强的研发和工程设计能力，完善的科研，设计，办公硬件，运用世界先进的技术，完善的设备制造能力，拥有油脂工艺，电器，自控，机械等高级工程技术人员30多名，并与河南工业大学建立了良好的合作关系。承接了多项国内外重大的工程和技术服务项目，公司配备现代化的安装设备，拥有专业的经验丰富的工程安装队，安装质量优秀。

公司致力于新产品，新工艺的开发，研发了 1-120TPH 棕榈榨油设备，工艺设计和设备制造达到世界领先水平。设备出口到印尼，马来西亚，泰国，尼日利亚，利比里亚，刚果等多个国家和地区。

Henan Doing Mechanical Equipment Co., Ltd is located in Zhengzhou City, Henan Province, China. Doing group is an enterprise integrating engineering R&D, equipment manufacturing and installation, project contracting, technical service and international trading. We are mainly engaged in grain & cooking oil machinery, tire pyrolysis and distillation machinery, cassava products deep processing machinery, starch machinery, syrup machinery, etc.

Our company has powerful capability of scientific research, designing, office hardware facilities, and we use advanced techniques, top ability of manufacturing device. We have more than 30 senior technical staffs majored in oil technology, electrical appliance, automation and machinery, we establish perfect cooperation with HENAN UNIVERSITY OF TECHNOLOGY, and have undertaken to complete a number of major engineering and technical service abroad. We own a professional installation team with rich experience, which guarantee the quality of the project.

Doing Group focuses on developing new products & technology, we have developed 1-120TPD palm oil processing equipments, our designing technology and manufacturing ability have reached the top level in the world.

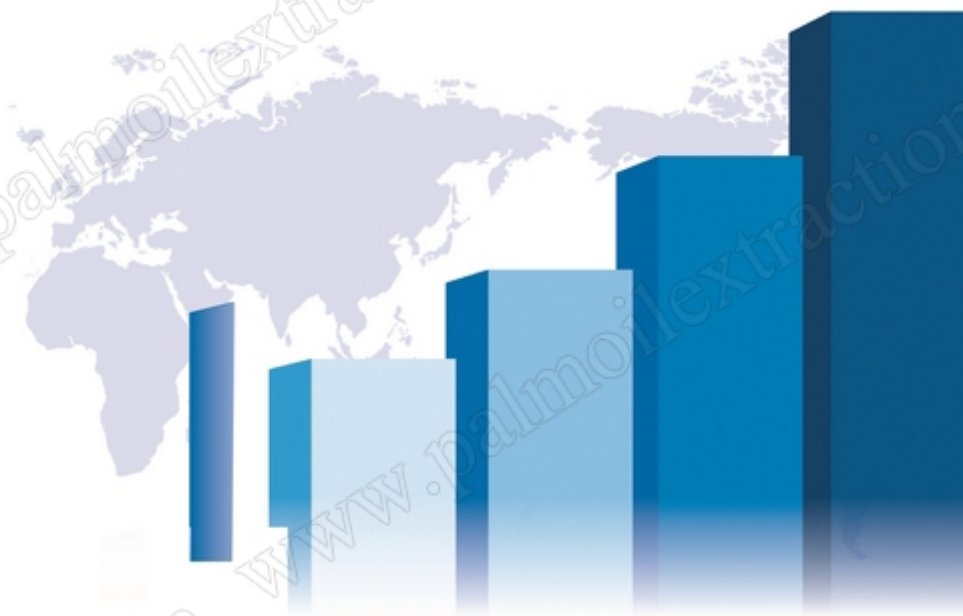
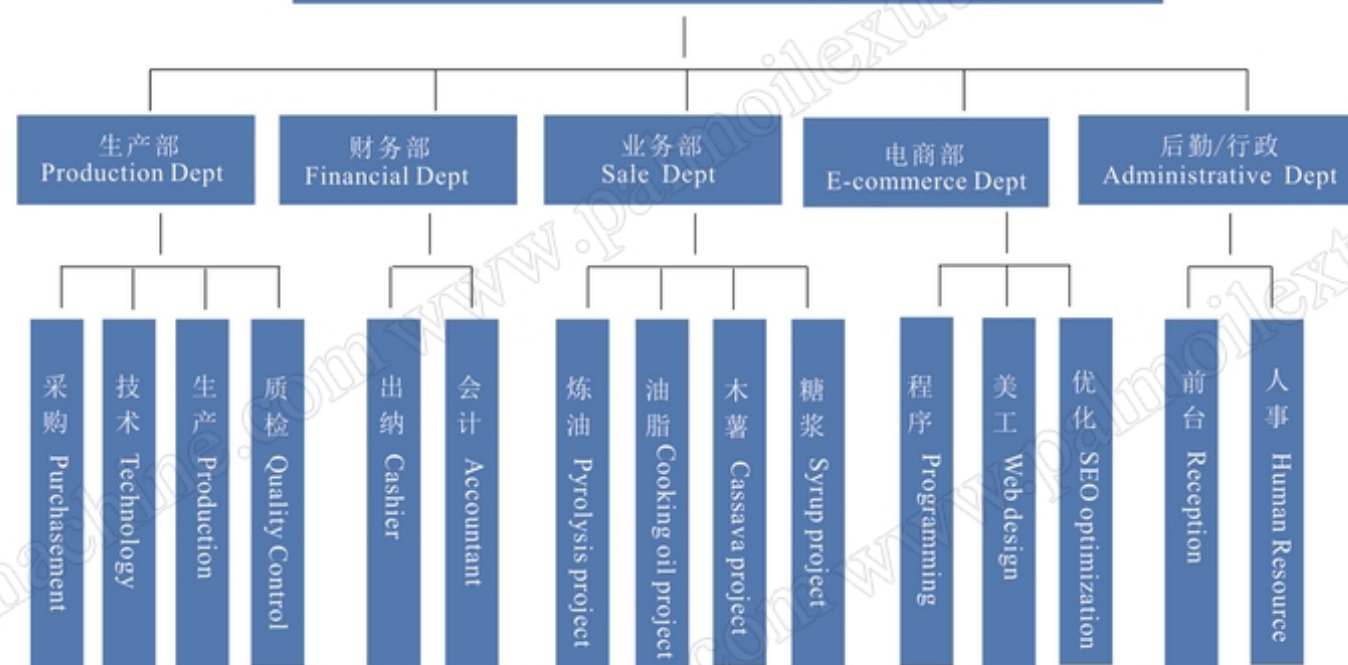


公司组织结构 COMPANY DEPARTMENT

业务范围 BUSINESS SCOPE



Henan Doing Mechanical Equipment Co., Ltd



- 1) 1-10tph 小型棕榈压榨设备
1-10tph small scale palm fruit processing plant;
- 2) 15-60tph 中型棕榈压榨设备
15-60tph medium scale palm fruit processing plant;
- 3) 60-120tph 大型棕榈压榨设备
60-120tph large scale palm fruit processing plant;
- 4) 1-600tpd 棕榈油精炼设备
1-600tpd palm oil refinery plant;
- 5) 1-600tpd 棕榈油分提设备
1-600tpd palm oil fractionation plant;
- 6) 棕榈仁油压榨设备
Palm kernel oil extraction plant;

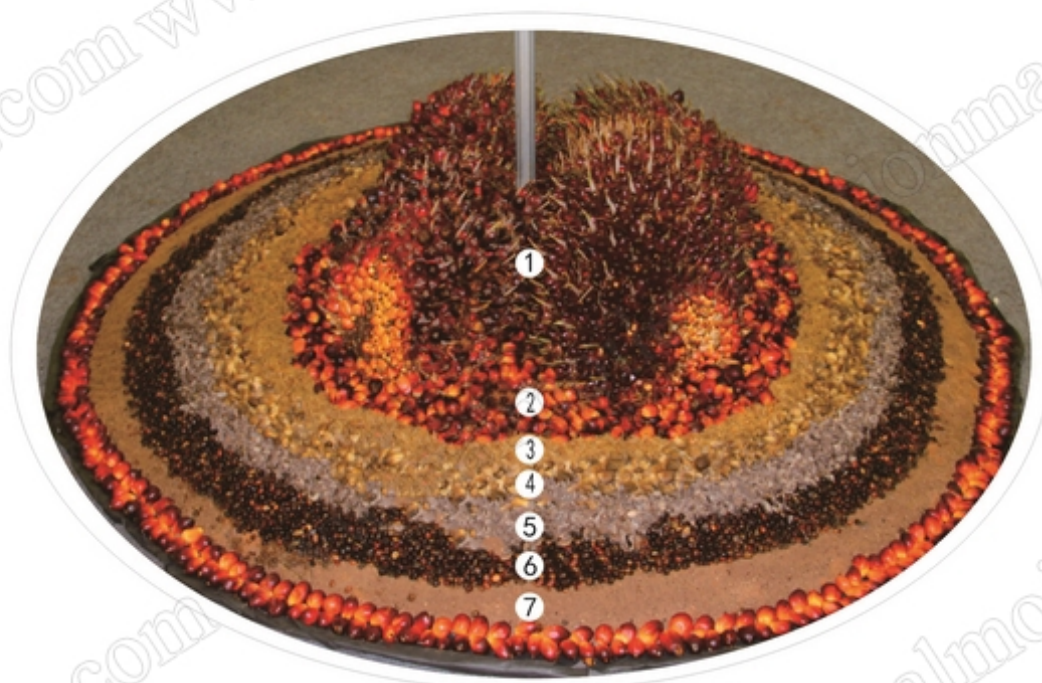


棕榈概况

BASIC INFORMATION OF PALM FRUITS

油棕属于棕榈科，主要产地分布在热带地区和部分亚热带地区，它是一种重要的热带油料作物。油棕含油率很高，一般鲜果肉含油46~50%，棕仁含油50~55%。

Oil palm belongs to palmaceous plant; It is mainly distributed in tropic area and some sub-tropic areas; It is one of the most important tropic oil seed plants in the world . The oil rate in oil palm is very high: generally 46~50% in the fresh pulp , and 50~55% in palm kernel.

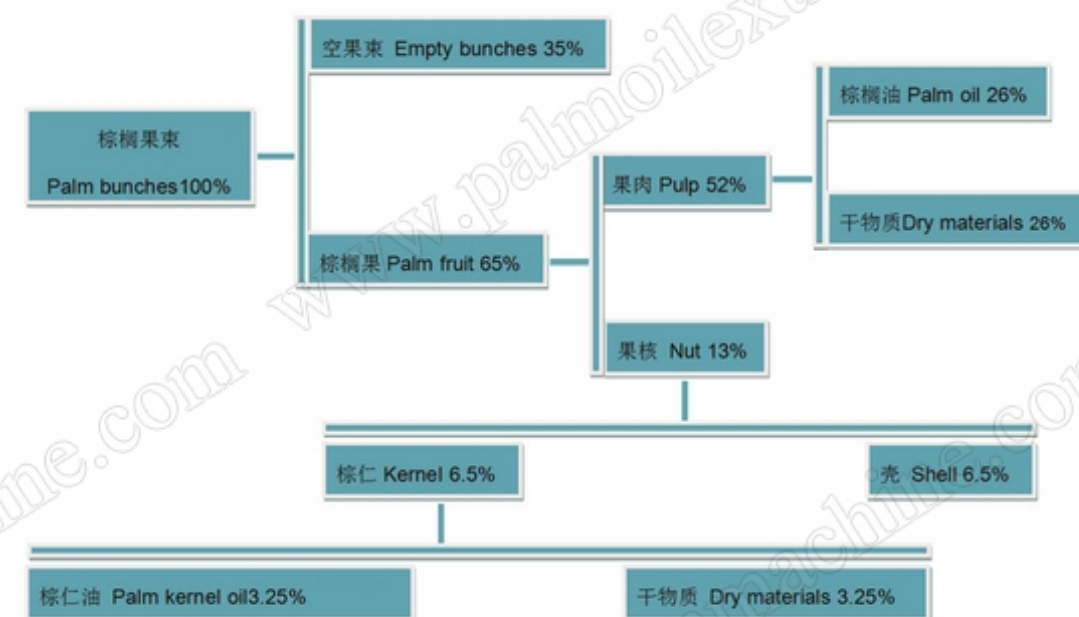


棕榈果展示 Basic information of palm fruits

1	5
2	6
3	7
4	

- 1 FFB (Fresh palm fruit bunch)
- 2 Palm fruit
- 3 Fiber
- 4 Palm nut
- 5 Nut shell
- 6 Palm kernel
- 7 Kernel cake

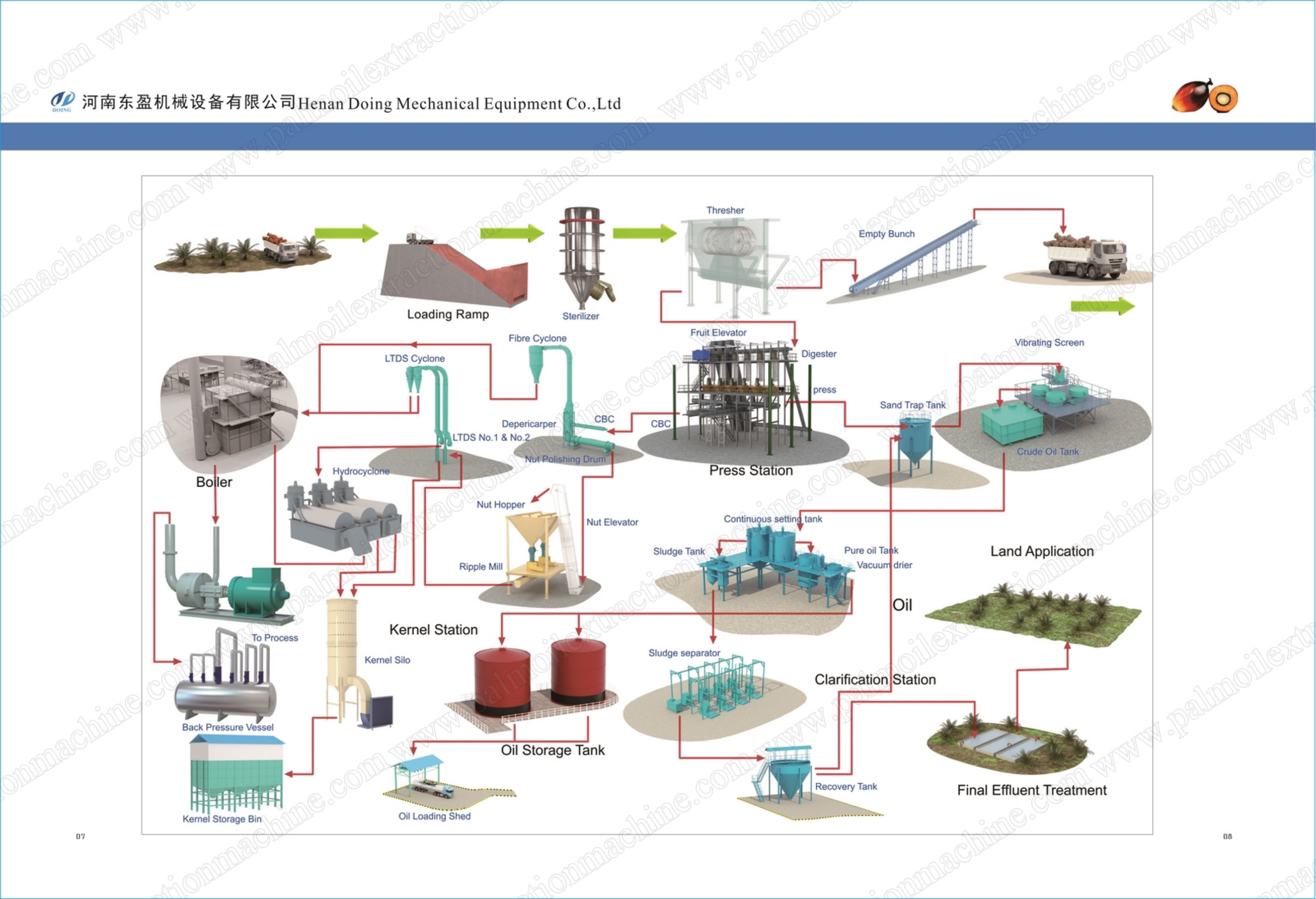
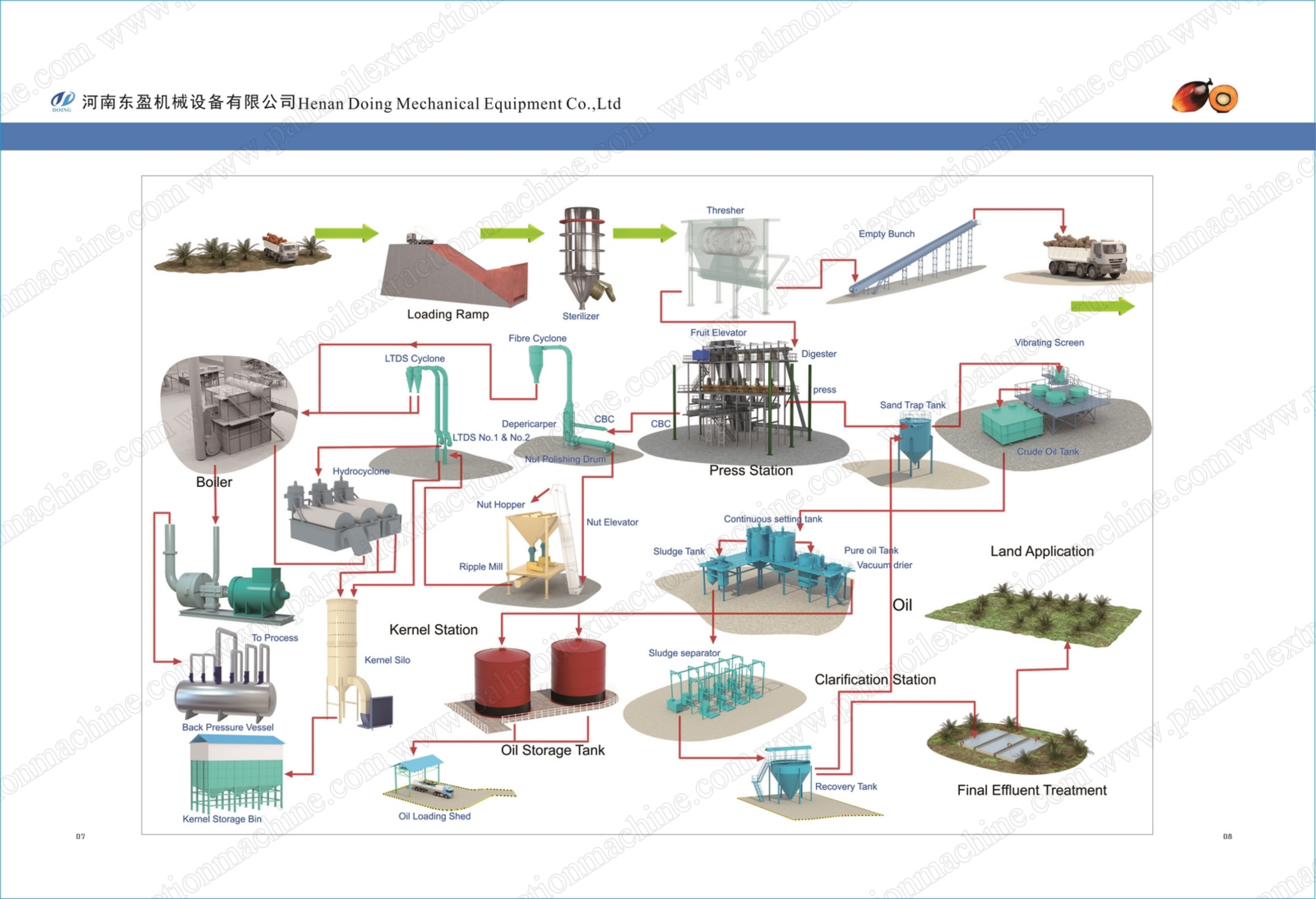
棕榈果串含油量 OIL CONTENT OF FFB



棕榈果 Palm fruit



棕榈毛油 Crude palm oil





棕榈油生产过程 →

Palm oil processing plant

- 原料接收站 Raw Materials Reception Station
- 杀酵站 Sterilization Station
- 脱果站 Threshing Station
- 捣碎压榨站 Digesting&Pressing Station
- 澄油站 Oil Clarification Station
- 仁回收站 Kernel Recovery Station

原料接收站

RAW MATERIALS RECEPTION STATION

果园内采集到已经成熟的新鲜果穗用卡车运载，经地磅称重记录后，将果穗倒入卸料台内。卸料台带有滑动门出口。每个滑动门的开关是通过液压控制的，液压控制系统由液压泵站和液压缸组成的，启动控制阀打开卸料台料门，果穗落入鲜果束刮板内。

Collecting the ripe fresh palm fruit bunches from the plantation and transported by trucks, then pour the FFB into the discharge door after weighed by weighbridge.

The discharge platform with sliding gate exit, every sliding gate switch is controlled by hydraulic system, which consists of hydraulic pump station and hydraulic cylinder. Start the control valve to open the gate of the discharge door, then the palm fruits falls into fresh palm fruit bunches conveyor.





杀酵站

STERILIZATION STATION



所谓灭菌杀酵是在杀酵设备中用0.3MPa的蒸汽，对油棕果进行高温蒸煮约60min，破坏果肉中的脂肪酶，以免油中的游离脂肪酸含量升高。此外，高温杀酵可使果实松软，便于机械脱粒，也有利于后续果核的剥壳，减少果仁的破损。

Sterilization is a process that injecting 0.3MPa direct steam into the sterilizer to boil the palm fruit for about 60 mins. The purpose is to break the enzymes in fruit, and to avoid the increasing of the FFA content in oil. At the same time, the high temperature makes the fruits soften, it is easy for fruit threshing, palm nut cracking, and reducing the damage of kernel.



脱果站

THRESHING STATION

油棕的果粒占整个果束的 60% 左右，脱粒的目的是把油棕果从果束上分离出来。机械脱果常采用转鼓式脱粒机。这种脱粒机内部有一个长长的卧式转鼓。分离后的油棕果排出进入压榨站。空果串从转鼓的另一端排出到堆场，或运出厂区做棕榈果园覆盖物循环利用，或现场焚烧作为肥料施于农田。

Oil palm fruit accounts for about 60% of the whole FFB, the purpose of threshing is to separate the palm fruit from the FFB. The thresher mainly adopts drum type thresher. There is a rotary drum inside of the threshing machine. The separated palm fruit is sent to the pressing station. Empty palm fruit bunches are discharged from the other side of the thresher, and then the EFB is transported to the yard, or to palm plantation as fertilizer or slipcover.





捣碎压榨站

DIGESTING & PRESSING STATION

捣碎用于将果肉和果核分离且捣烂果肉组织；棕榈果经过杀酵、脱果和捣碎后，增加棕榈果的出油率。

捣碎蒸煮罐内壁装有多块挡板和搅拌，通过顶部电机的带动，绞刀将果肉捣碎，同时捣碎罐内部通入直接蒸汽，对棕榈果肉进行蒸煮，更容易出油。

棕榈果进入连续式双螺旋榨油机压榨，榨油机采用液压控制系统调节榨螺间的间距。适合不同种类的棕榈果品种，保证出油率。压榨得到的油经净化得到棕榈毛油，压榨后得到的核与纤维的混合物经进一步的分离得到的核进行储存，纤维作锅炉燃料。

Digesting is for crushing palm fruit, use high temperature to soften the fruit and kill the bacteria. Sterilizing, threshing and digesting all help to increase the palm fruit oil yield.

Inside the digester, there are baffles and stirring arms, under the driving of the top motor, rimer breaks off the palm fruit and boil the palm fruit, so it can press oil out easily.

Pressing machine uses hydraulic control system to adjust spaces between screws. It is suitable for various palm fruit species and guarantees the oil yield. After pressing, the crude palm oil needs to be purified, the palm nut and fiber impurities can be processed by further separation from the pressed cake. The palm nut is stored for deep processing, and the separated fiber are used as the boiler fuel.



捣碎压榨站 Digesting & pressing station



捣碎压榨站 Digesting & pressing station



澄油站

OIL CLARIFICATION STATION

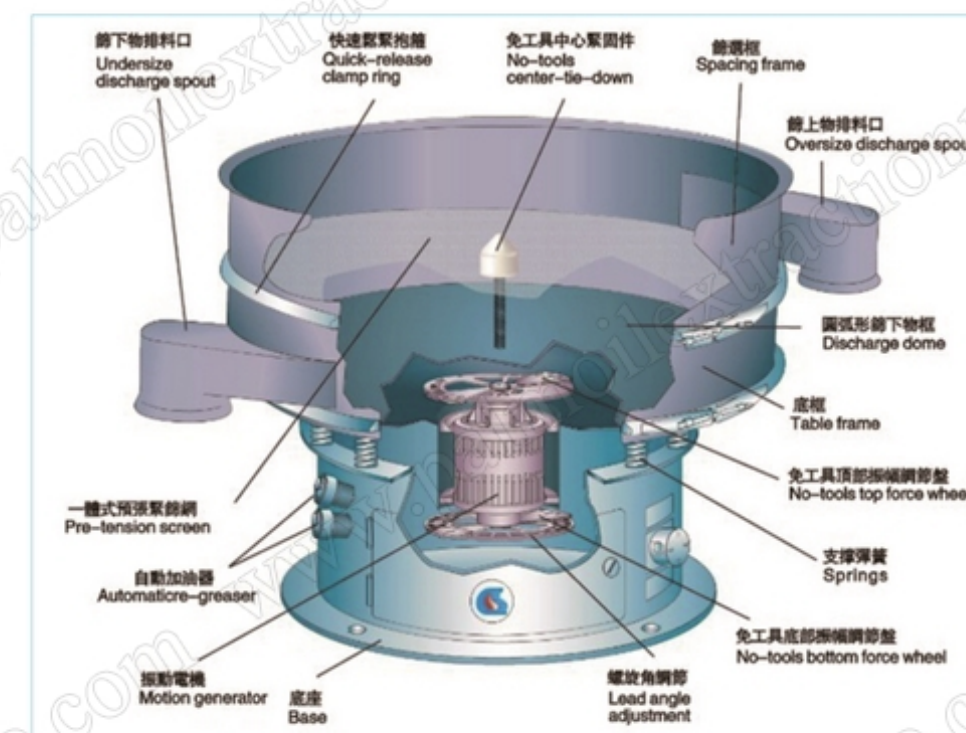


采用最新的工艺，在保证油品质的前提下，尽量减少设备的投资，降低油损失。机榨毛油经过净化(沉降，过滤，分离)得到的棕榈毛油可以售卖或者进一步精炼。

压榨得到的油经净化之后残余物进入污水处理池，污水处理后的污泥可作为棕榈树的肥料。整个过程自动化程度高，环保节能。

Advantages: Use latest technology; Guarantee the oil quality; Reduce machine investment; Lower oil loss.

The purified palm oil can be directly sold or deeply refined. After clarification, the industrial sewage will be sent into effluent pond. Then the residual sludge can be used as fertilizer. The whole process is high automatic, environment-friendly and energy-saving.



棕榈毛油
Crude palm oil



澄油设备 Clarification machine



过滤后的油 Filtered palm oil



仁回收站

KERNEL RECOVERY STATION

压榨后的核与纤维的混合物经碎饼绞龙输送至纤维分离系统进行纤维、核分离，分离后的棕榈核输送到核仓储存。

棕榈核经过破碎机破碎，得到仁壳混合物。棕榈仁壳混合物首先采用分离柱系统初步分离后，输送到泥浴分离系统进一步分离，最终仁壳分离率可达97-98%。分离后的壳送往锅炉房作燃料；分离后的仁通过热风干燥含水率降至8%以下，干燥后的仁送往仁储仓进行储存。

The pressed cake(fiber&nut mixture) is transported to the fiber separation system for fiber&nut separating. The separated nut is sent to nut silo for temporary storage.

The palm kernel nut is crushed by ripple mill, then get the mixture of palm kernel and shell.

Majorities of palm kernel are separated out through separating column system and then the rest parts use hydro-cyclone equipment to further separation. The kernel and shell separation rate can reach up to 97-98%.

After separation, the shell is used as boiler fuel; the moisture content of separation kernel is less than 8% after hot air drying. Dried kernel can be sent to kernel storage silo or warehouse.



抛光滚筒 Nut Polishing Drum



分离柱系统 Separating Column System



仁回收 Kernel Recovery



主要输送设备

MAIN CONVEYING EQUIPMENT



Scraper Conveyor
刮板输送机

Belt Conveyor
皮带输送机

Bucket Elevator
斗式提升机

Screw Conveyor
螺旋输送机



动力房 POWER HOUSE

采用柴油发电机及汽轮发电机动力，为生产及生活用电提供动力，环保节能。
Use diesel powered generators and turbine generators to provide the energy and electricity for production and household usage, being energy-saving and environment-friendly.



锅炉房 BOILER ROOM

采用生物质蒸汽锅炉，热力充足，产汽快，蒸汽品质高，运行平稳可靠，燃料适用性广，安全性能高。

The biomass steam boiler has the advantage of sufficient heating power, fast production of high quality steam, stable and reliable operation, wide fuel applicability, and better safety performance.



水处理 WATER TREATMENT

源水（河水）经过加药沉淀，过滤处理变成纯净水后，为锅炉提供软水和工艺用水，保证水的质量，也确保了油质。

After dosing, settling and filtration, the source water (River water) can be changed into pure water which is used for water supplying in steam boiler and process use, ensuring the good quality of water as well as the oil.





毛棕油精炼工段

CRUDE PALM OIL REFINING PROCESS

精炼是生产一级食用油的重要步骤。根据不同的用途需要，我们采用物理精炼的方法来去除油中有害物质和杂质，可以得到高质量的精炼棕榈油。

一般油料精炼过程包括：脱胶 脱酸 脱色 脱臭。而对于棕榈油这种油料，我们设计了棕榈油干法脱胶全连续精炼的工艺，把脱胶和脱色相结合，脱酸和脱臭相结合。这种设计具有这些优点：成本相对较低，生产消耗小，油损耗低，精炼油质量更稳定。

Palm oil refining is a very important process to produce first grade edible oil. According to the different usages and requirements, utilizing the physical methods to get rid of the harmful impurities and needless substance from the crude palm oil, and then can get good quality refined palm oil.

For common vegetable oil refinery plant, it includes four processes: degumming, deacidification, decolorization and deodorization. While for the palm oil refinery plant, we designed the Dry-degumming process Full Continuous Refining method. In this method we combine degumming process together with decolorization, and combine deacidification with deodorization. This refinery process has advantages of: low cost, less civil consumption, less oil lost and more steady quality of refined palm oil.



连续脱色、过滤工段

CONTINUOUS DECOLORIZATION & FILTERING PROCESS

在该工段我们采用最新的全连续脱色工艺，采用两台叶片过滤机，充分混合后的混合油溢流进入脱色塔进行充分脱色，脱色后的油由脱色泵泵入两台叶片过滤机，两台叶片过滤机交替使用，阀门切换使用自控切换，过滤后的清油经两道保险过滤进入脱臭工段。



The newly complete continuous decolorization (bleaching) section uses two alternate filters. The mixing oil and earth flow into the Vacuum decolorization (bleaching) tower. The decolorized oil is pumped through the alternate filters. The valves are automatic switched. Filtered oil is pumped into deodorization section after safety filters.



连续脱臭工段

CONTINUOUS DEODORIZATION PROCESS



待脱臭油和脱臭油热交换后送入脱臭系统前经导热油加热器加热。经过加热后的油先经过特殊设计的筛板塔，除去大部分的脂肪酸，然后至脱臭塔。游离脂肪酸在此部分被去除至绝对低的水平，油中的某些气味物质需要较长的停留时间最终也将在塔盘中被最终去除或失活。在保留塔盘层中的油一直会被喷入一定比率的搅拌蒸汽。

After heat exchange between the deodorized oil and un-deodorized oil. The oil is heated again by conductive oil before deodorization system. Before deodorizer, the heated oil needs to pass through sieve-plate columns, which is specially designed to remove large amount of fatty acid. Right here, the fatty acid amount will reach absolutely low. Some odor material needs long time to be removed, but will be finally removed or inactive in column-plates. The oil reserved in the column-plates will be sprayed into a ratio of mixing steam.



经过脱臭的油打至填料塔进一步脱酸、脱臭，然后打出与待脱臭油换热、冷却，然后通过交替使用的精滤器进行再次抛光过滤，最后和冷却水进行热交换冷却至储存温度进入储油罐。

Deodorized oil needs deep deacidification and deodorization by pumping into the packing tower, and then to be discharged to have heat exchanging with pre-deodorizing oil, lastly to be cooled. After passing through alternate security filter, the deodorized oil is cooled to storage temperature with cooling water.

毛油质量指标 Quality of crude palm oil

Acid value 酸价 (mg KOH/g)	≤10
FFA content 游离脂肪酸含量	≤5%
Water content 水分 (%)	≤0.5
Insoluble impurity 不溶性杂质 (%)	≤0.1
DOBI	≥2.4min
Phosphorus content 含磷量	≤100ppm

精炼后成品油质量指标 Quality of final product:RBD palm oil

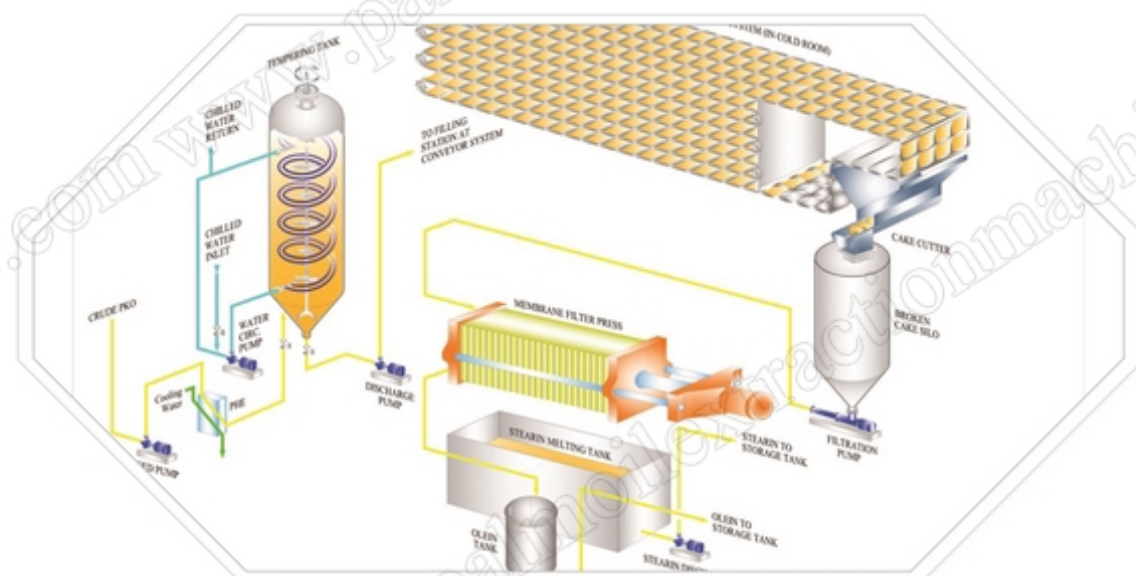
Color 色泽 (Lovibond colorimetry 罗维朋比色槽 5/4")	Y25, R2.5
Flavor and color 气味及色泽	Natural 自然
Insoluble impurity 不溶性杂质 (%)	≤0.05
Moisture and volatility 水分及挥发物 (%)	≤0.05
Acid value 酸价 (mg KOH/g)	≤0.2
Peroxide value 过氧化值 (mmol/kg)	≤0.5



分提 FRACTIONATION

油脂是由不同熔点的甘油三酯组成的，在一定的温度下分离不同熔点的硬脂和软脂就是分提。

Fractionation: oil consists of triacylglycerol with different melting points, under certain temperature, separate the olein and stearin according to their different melting points and melting percentage.



分提的意义：

1. 影响油的利用价值：如起酥和人造黄油这样的食品深加工食品，如果软脂含量低，食品就会更加稳定，可储存更长时间。
2. 一些食品级的植物油对清澈度要求很高，如果里面硬脂含量高，油看起来会浑浊。

Significance of fractionation:

1. Affect oil use value: for making food products like shortening and margarine etc, if the olein in oil is low, the food will be more stable, and can store longer time.
2. Some first grade vegetable oil has a strict demand on the clarity, if the stearin is high in oil, the oil will be cloudy.

棕榈油干法分提工程包括结晶、过滤工段。分提车间设计主要用于连续加工精炼棕榈油分提，其工作原理描述如下：

The dry fractionation of palm oil includes crystallization section and filtration section. The plant is designed to continuously process RBD Palm Oil, and the operation description as following sections:

结晶工段 Crystallization section

原料经板式换热进入结晶罐。计量原料进入结晶罐结晶工段，在预先设定的参数程序控制下冷却油，此参数是借助于盘管内的冷却介质循环来实现的，其设计取决于原油的质量和要求的分提的硬脂和软脂的质量。结晶罐配有变速机械搅拌，以保证搅拌均匀一致；根据原料及成品油脂质量要求，冷冻一定时间，当油在液体软脂中出现如半固体状的硬脂结晶时（浆状），准备过滤。如果结晶效果不好，将浆状物送至进料油加热器进行再次结晶。

Feedstock is heated and pumped to crystallizers. The oil is cooled according to a pre-determined cooling profile by means of controlling the temperature of the cooling medium circulating in the cooling coils. The design of this cooling profile depends on the quality of feedstock and the quality of olein/stearin fractions required. The crystallizers is equipped with frequency mechanical agitation to keep the oil mixing uniform. According to the feedstock and product oil quality requirement, the cooling program lasts for a certain time, and when the oil appears as a thick semi-solid mass (slurry) containing stearin crystals in liquid olein, it is ready for filtration. If the crystallization result is not desirable, the slurry can be circulated through the feed oil heater for re-heating before being sent back to the feed oil tank for re-processing.





过滤工段 Filtration section

结晶完毕，将浆液打入隔膜压滤机过滤。隔膜压滤机操作分为进料、过滤、压榨、卸渣四道工序。滤饼形成，滤液澄清后开始过滤，过滤室充满，输送泵停止；通过压缩空气挤压滤饼一定时间，当滤饼中残留基本排出后，用压缩空气将隔膜压滤机进油和出油管道内存油吹尽，关闭压缩介质控制阀门，解除压滤机内压力；打开过滤机板框，将硬脂落入专用压滤机下方的硬脂收集罐，通过加热装置将罐中的硬脂熔化后，泵至室外硬脂罐；软脂流入软脂罐，并由泵抽出至室外软脂储罐。

隔膜压滤机在几次过滤周期后需进行清洗。

When crystallization is completed, the slurry is fed to the Membrane Filter Press for filtration. The operation includes filter feed, filtering, squeezing and cake releasing.

When the chambers are full after cake forming, the pumping will stop and the membranes are inflated to squeeze dry the filter cakes. After that, the residual oil in the core is blown dry by compressed air. Thereafter, the filter is opened and the cake will drop into a stearin tank. The stearin cake is melted in this tank by steam coils before it is discharged to storage. Olein flows into the olein tank, and is pumped to the outer olein storage tank.

The membrane filter press requires cleaning after several filtration cycles.



精炼油指标

Parameter of RBDPO required:

I.V. (g I2/100g) 碘值 (g I2/100g)	50~52
Moisture & impurities (%) 水分和杂质	≤ 0.1
FFA content (%) 游离脂肪酸 (%)	≤ 0.1
Inlet temperature (°C) 进口温度 (°C)	50°C

成品油质量指标

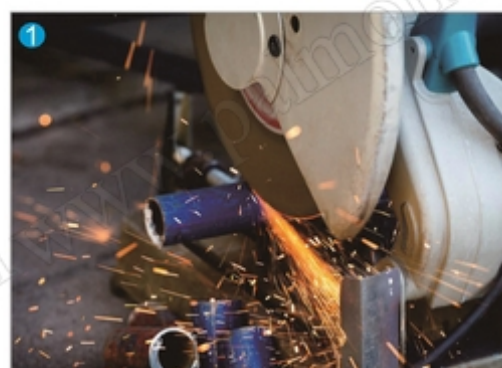
Parameter of final product:

	Olein软脂	Stearin硬脂
I.V. (g I2/100g) 碘值 (g I2/100g)	≥56	32-34
Moisture & impurities (%) 水分和杂质 (%)	0.1	0.1
Yield (%) 得率 (%)	≥79±2	≤21±2



加工实力

MANUFACTURING ABILITY

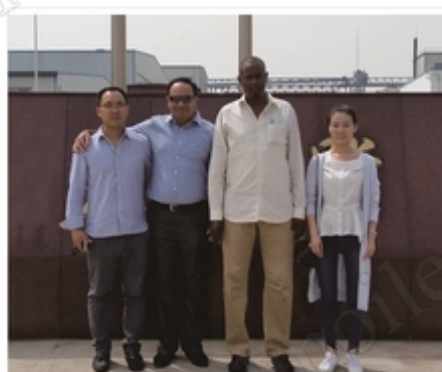


- ① Cutting Machine 切割机
- ② Rolling Machine 卷板机
- ③ Drilling Machine 钻床
- ④ X-Ray Crack Detection Room X-Ray探伤室



- CNC Plasma Cutting Machine ①
数控等离子切割机
- Impact Testing Machine ③
冲击试验设备
- Argon Arc Welding ⑤
氩弧焊

- CNC Milling Machine ②
数控铣床
- Automatic Welding Equipment ④
自动焊接设备



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PROJECT CASE

项目案例



PROJECT CASE



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DELIVERY



