



Castor Oil

Process Mechanization for JBCO



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Outline

- ▶ Risk associated with processing castor oil
- ▶ Overview of the process for production of castor oil
- ▶ Review of traditional method for producing JBCO
- ▶ How to produce JBCO using modern methods and equipment/machinery




Safety Precautions

Health Risk


- ▶ Castor beans are poisonous
- ▶ Beans should be stored out of reach of children
- ▶ If chewed and swallowed, **2-4 beans can kill a child**
- ▶ 4 - 8 beans lethal dose in adults
- ▶ Contain ricin




What is Ricin?

- ▶ A toxin found within castor beans
 - ▶ Most dangerous naturally occurring poison known to man
 - ▶ Stable under normal conditions
 - ▶ Inactivated by heat above 80°C (176°F)
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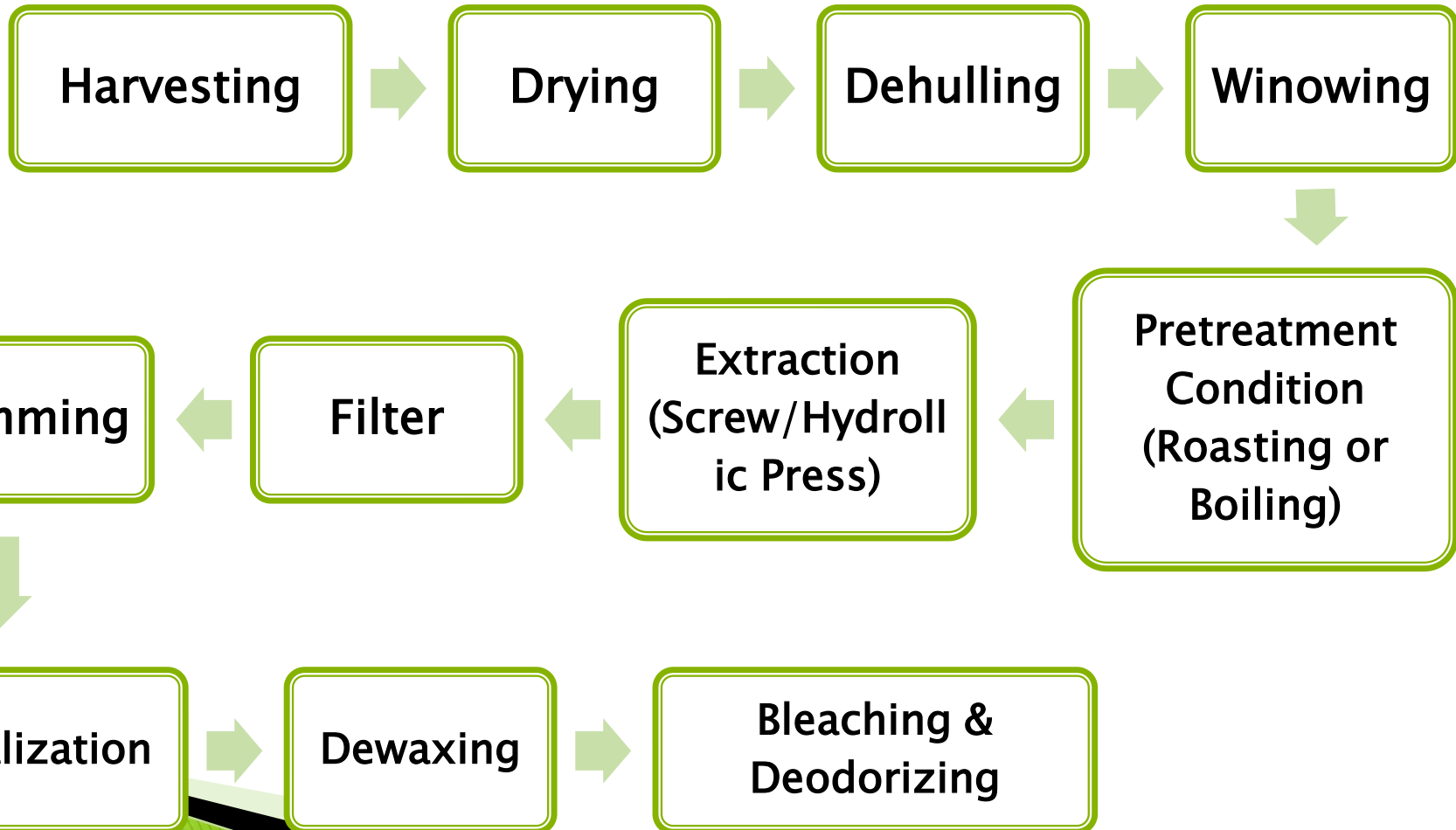
What is Ricin cont'd?

- ▶ Ricin is part of waste produced when castor oil is extracted from raw beans
 - ▶ Waste/cake need to be heat treated before use as fertilizer
 - ▶ Wear protective gears when using as fertilizer
- 

Signs and Symptoms of Ricin Exposure

- ▶ Vomiting and Diarrhea
 - ▶ Severe Dehydration
 - ▶ Low Blood Pressure
 - ▶ Seizure
 - ▶ Blood in Urine
 - ▶ Death (could occur within a couple days after)
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Overview of Process for Producing Castor Oil

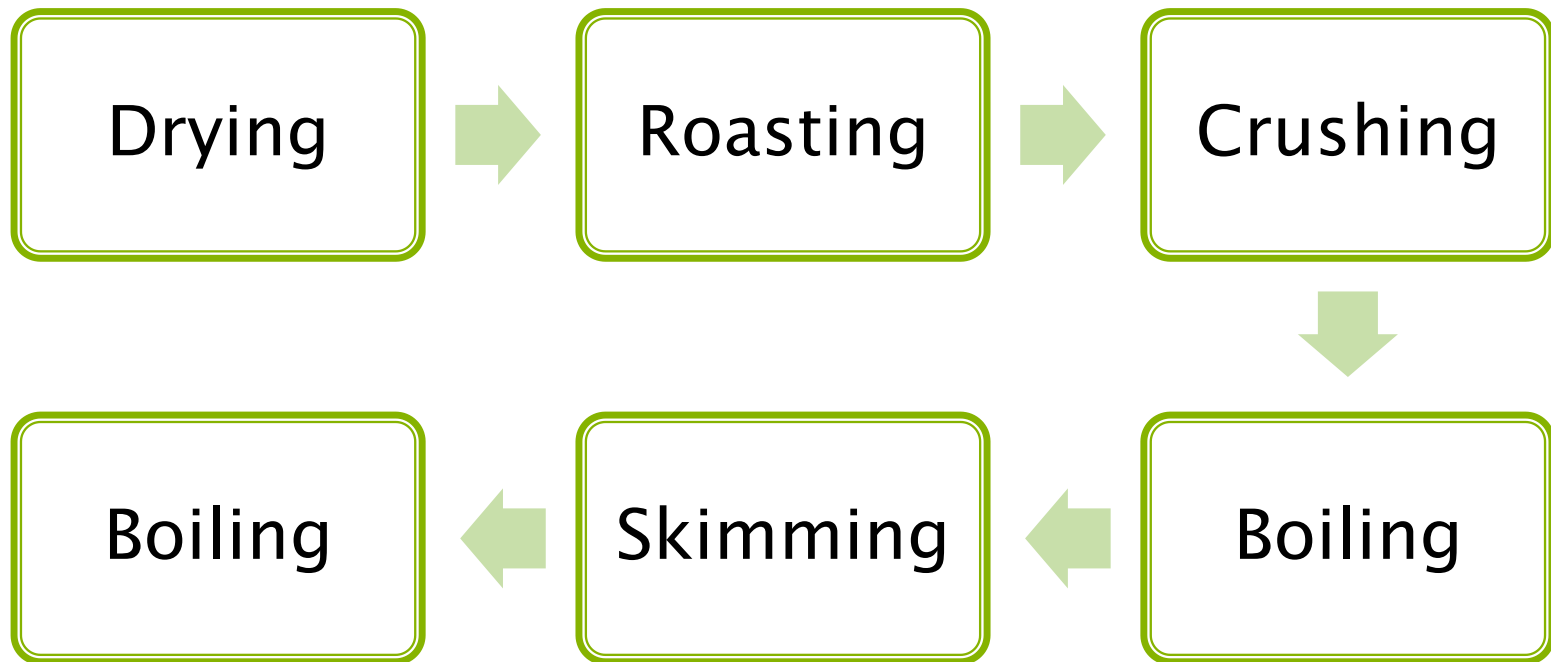


Processes and Equipment of Castor Oil Refinery Plant

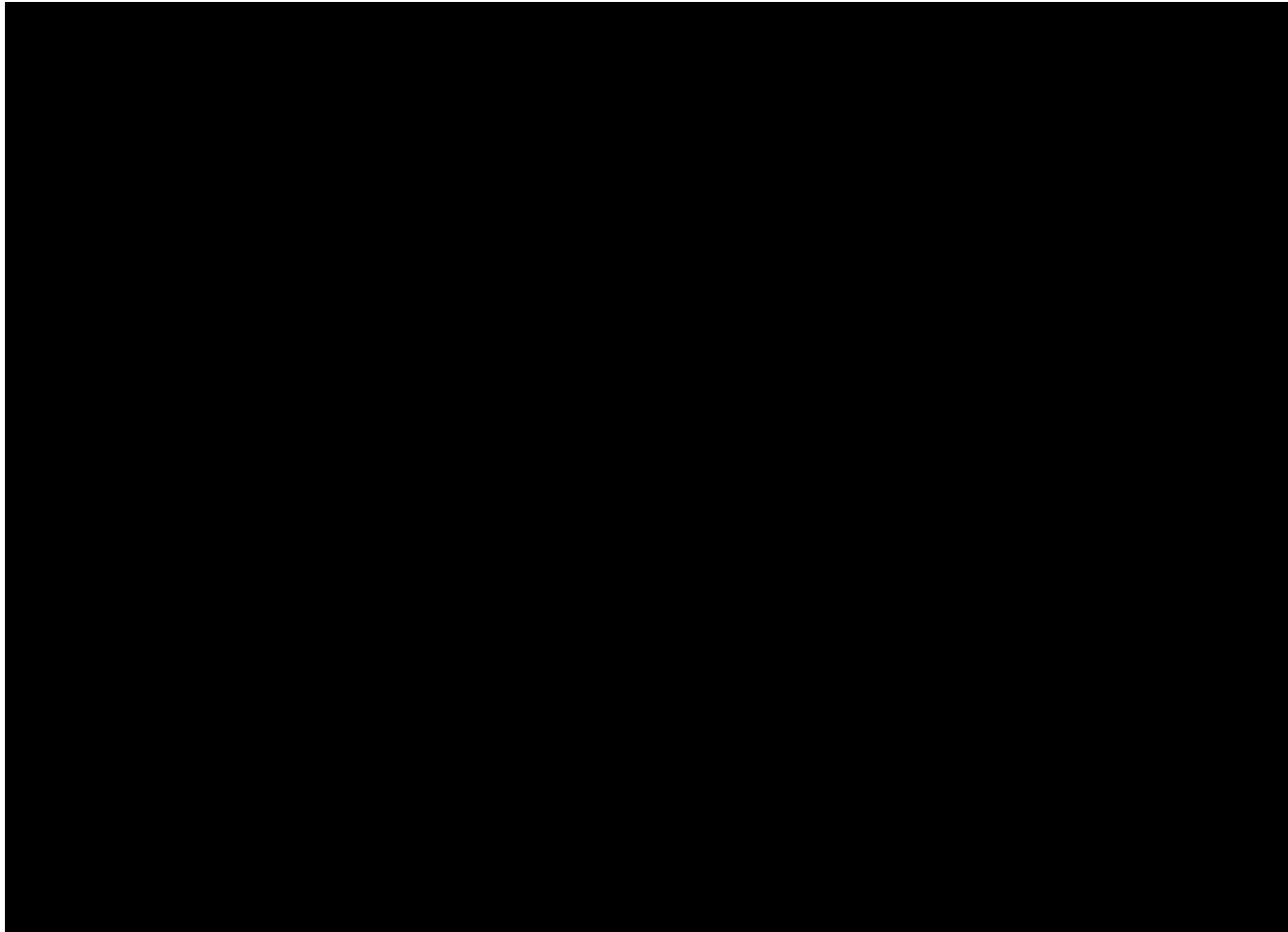
Process	Methods Involved	Equipments Used
Degumming	<ul style="list-style-type: none"> • Single stage Phosphoric acid treatment • Single stage hot water treatment 	Gums tank
Neutralization	<ul style="list-style-type: none"> • Alkali/ Chemical method • Steam Stripping 	Neutralizer Soap/gums tank Water/oil/gravity separator Lye/brine/hot water tank Neutralized oil tank Oil pump Soap stock pump Hot water pump
Dewaxing	<ul style="list-style-type: none"> • Removal of high melting point waxes 	Crystallizers Rotary drum vacuum filter Filter presses made out of polypropylene plate Frame filters
Bleaching	<ul style="list-style-type: none"> • Removal of pigments from fats and oils 	Bleacher Barometric condenser Earth dozer Bleached oil tank Filter press Filter pump Vacuum pump
Deodorization	<ul style="list-style-type: none"> • Steam distillation under high vacuum 	Falling film deodorizer Storage tank Cooler Polish filter Pump Vacuum system

Processing JBCO


Traditional Method




Traditional JBCO Process



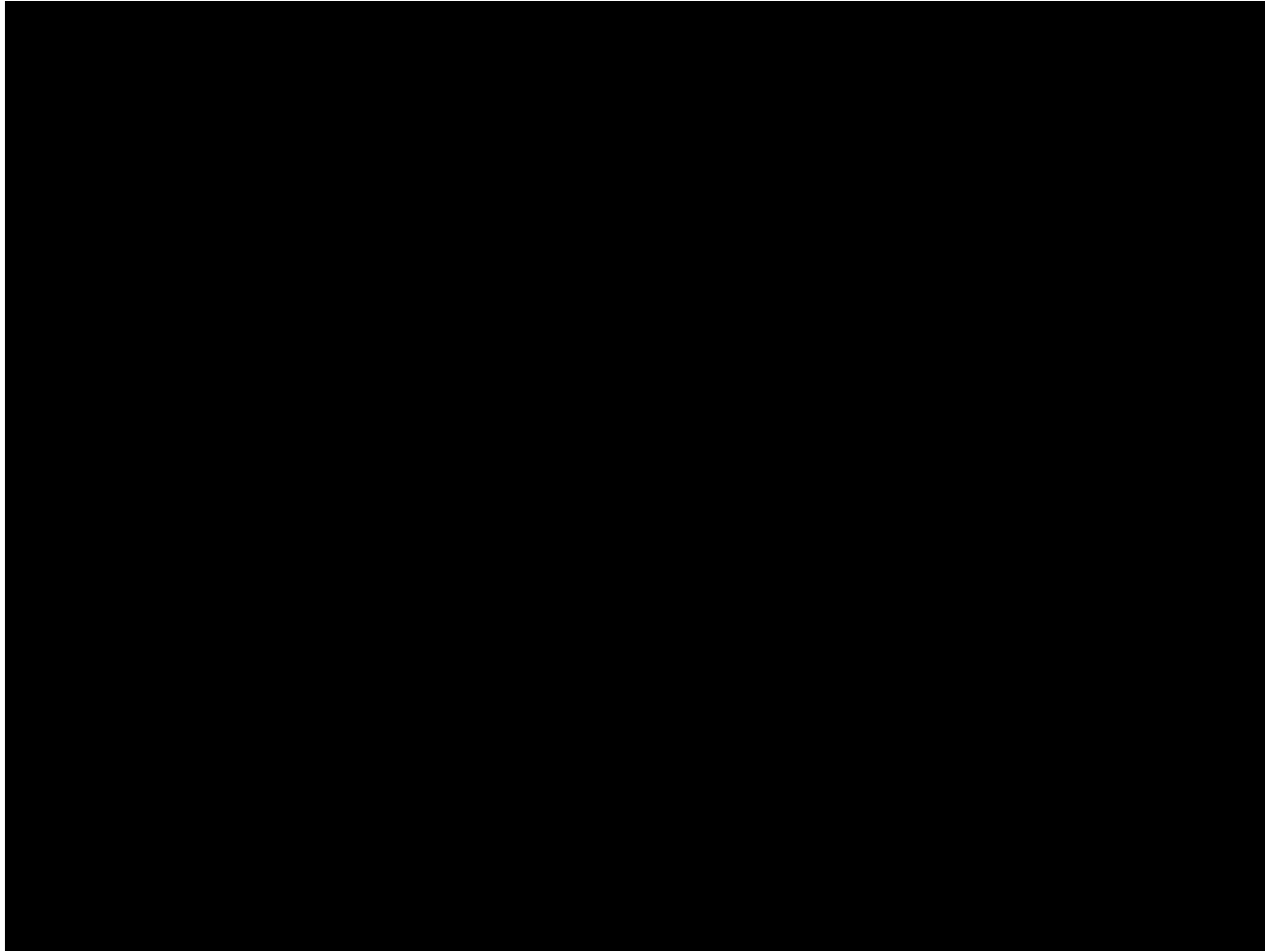
Traditional Method

- ▶ Tedious
 - ▶ 5–12 hours to obtain a batch
 - ▶ Inefficient
 - ▶ Average Process Yield – 19.4% by weight
- 

Equipment Needed to Replace Traditional Method

- ▶ Dehuller
 - ▶ Winowing machine
 - ▶ Bean/seed roaster
 - ▶ Screw press oil expeller
 - ▶ Filter press or oil cleaning centrifuge
- 

Dehulling and Winowing Process



Seed Cleaner



- ▶ The cleaner separates leaves, dust, husks, twigs, rocks, and other foreign matter from the beans.

Things to Consider before Oil Extraction

- ▶ Moisture content of beans

$$\% \text{ Moisture} = \frac{W_1 - W_2}{W_2} \times 100$$

- where W_1 is weight before drying, and
- W_2 weight after drying

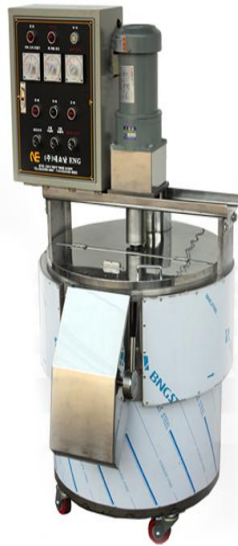


Field Moisture Analyzer

Can be used to determine moisture content

Pretreatment/Conditioning of Castor Beans

- ▶ Boiling
- ▶ Roasting



Infrared Thermometer

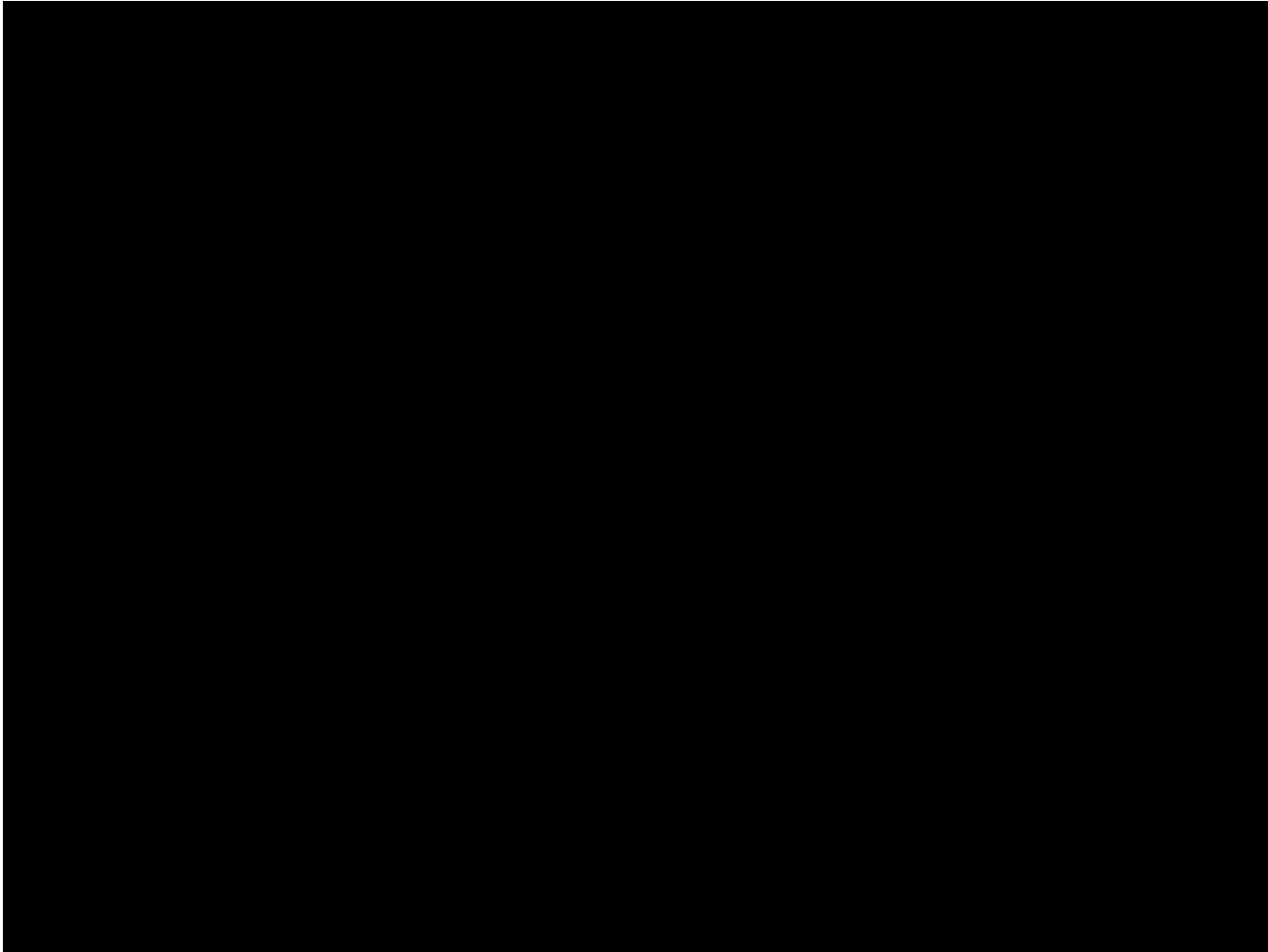


- ▶ Measures the temperature of the bean while roasting

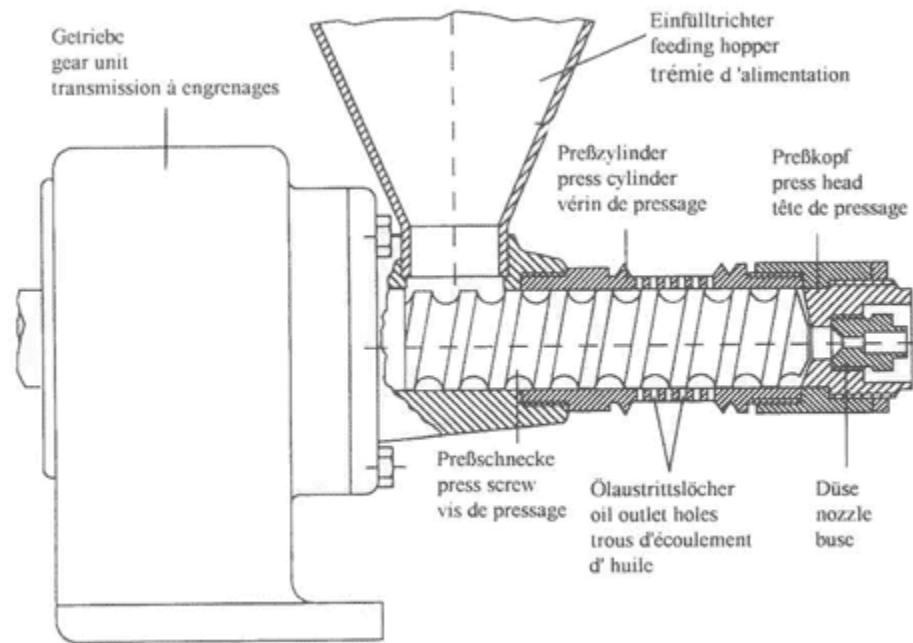
Extraction – Screw Press



Screw Press Oil Extractor



Schematic of Oil Press



Extraction – Screw Press with Vacuum Filtration System



Filtration/Cleaning of Oil



**Centrifugal Oil
Cleaner**

Plate and Frame Filter Press




Percentage Yield

$$\% \text{ Yield} = \frac{y_1}{y_2} \times 100$$

*where y_1 is weight of beans before extraction
and y_2 weight of the oil extracted

How Can SRC Assist in Improving JCIA Production Efficiency

- ▶ Collaborate with JCIA to acquire equipment for training purposes
 - ▶ Collaborate with JCIA to develop product specifications
 - ▶ Process Standardization
- 

Suppliers of Equipment

Supplier Information

Array Organics LLC
Address: Ross Barghi, 270
Broadmeadow Cove, Roswell
GA 30075
Tel: +1 678 898 0547
Email:
rossbarghi@arrayorganics.com

Oil Press Company
Address: 350 Industrial
Drive, Mondovi, Wisconsin,
54755
Email: sales@oilpress.co
Toll Free (USA Only): 877-
OIL-PRES (645-7737)
International Phone: +1-
715-926-1193

Huntsman, Inc.
2362 Warren Ave.
Twin Falls, ID 83301
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208-733-2240 fax
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*Thank
you*

