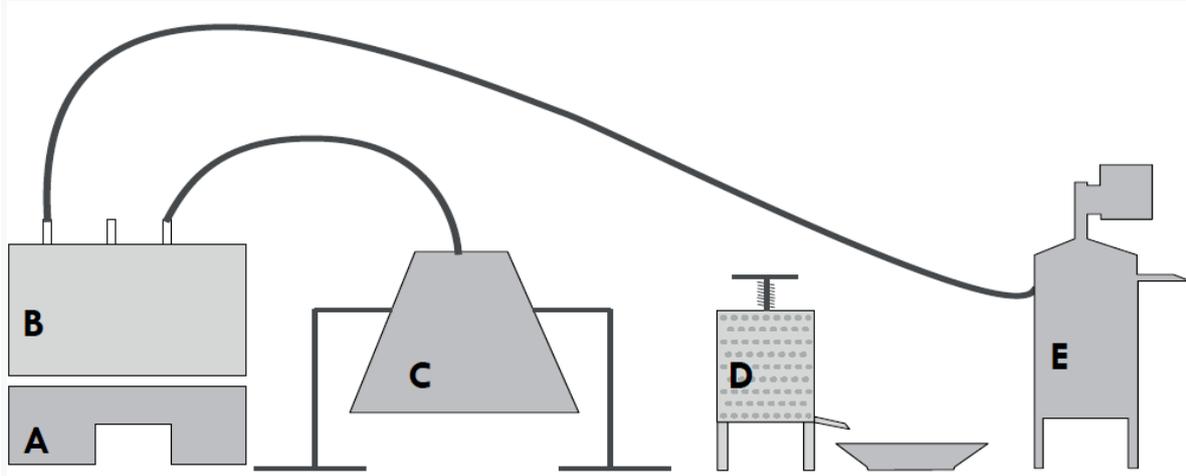


# PALM OIL PRODUCTION

***OPERATION MANUAL***

# MACHINE PARTS



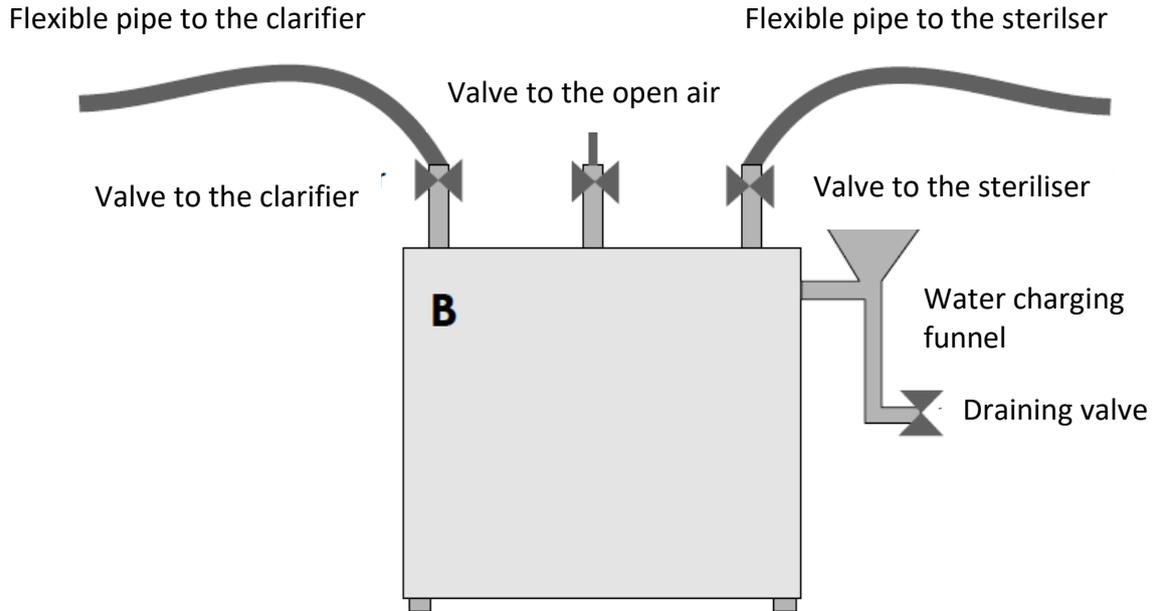
- A. Oven
- B. Boiler
- C. Sterilizer
- D. Press
- E. Clarifier

## **OPERATIONS**

- 1. Boiler start-up**
- 2. Sterilization**
- 3. Digestion**
- 4. Pulp Heating**
- 5. Pressing**
- 6. Clarification**
- 7. Final operations**

# USER MANUAL

## 1. Boiler start-up



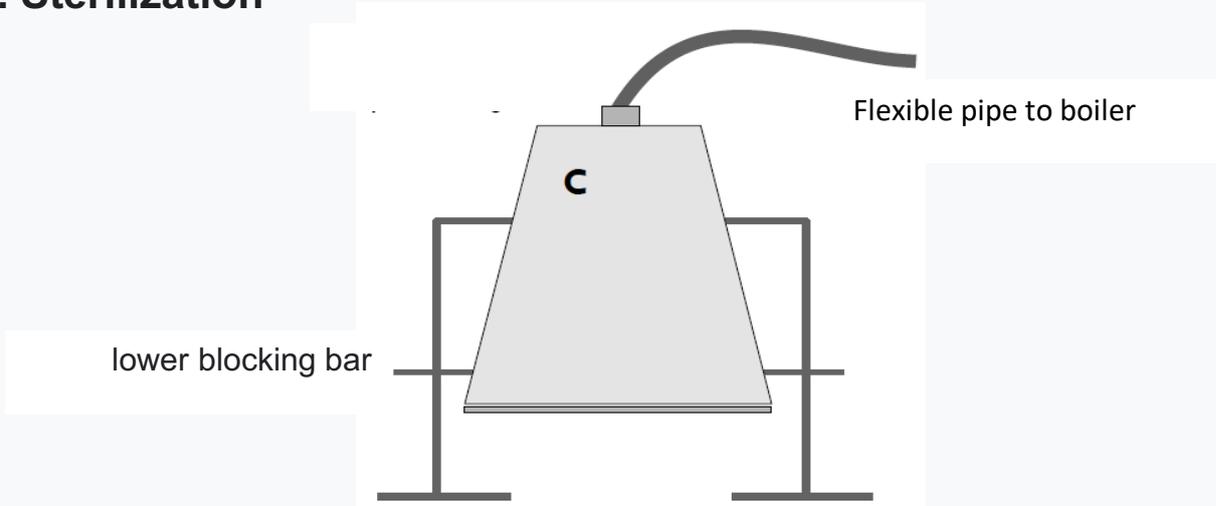
## **State of the installation at the start**

- Drain valve: closed
- Valve to the open air: open
- Valves to sterilizer and to clarifier: closed
- Flexible pipes attached to the valves

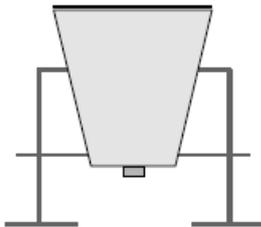
## **Operations to be performed**

- Pour approximately 40 liters of water into the boiler
- Light the fire
- Check that the fire is still lively
- Control the water level, adding more when the level has dropped  
Water must be added little by little so as not to cool the mass of water in the boiler
- The fire must remain lit until the end of clarification, but it must be very lively during sterilization and less lively in the other operations.

## 2. Sterilization

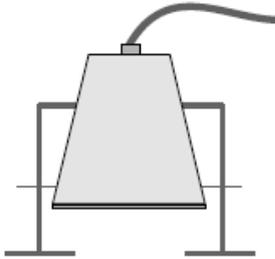


### First operation: fruit filling

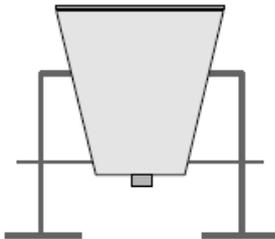


- Place the container with the large opening at the top
- Fix it using the lower bar
- Fill the sterilizer with fruits (about 100 kg)
- Put the lid on
- Remove the lower blocking bar

## Second operation: sterilization



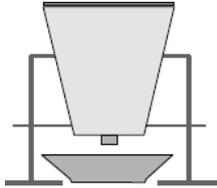
- Turn the container with the large opening at the bottom
- Fix it using the lower bar
- Attach the flexible connection pipe to the boiler
- Open the valve from the boiler to the sterilizer
- Close the valve to the open air
- Check that the fire is very high until at the bottom of the sterilizer steam starts to come out
- Continue supplying steam for 90 minutes (1h30).
- The fire can now be less intense, provided that the steam still comes out at the bottom of the sterilizer



## Third operation: emptying the container

after an hour and a half:

- Open the boiler valve to the open air
- Close the valve to the sterilizer
- Detach the flexible tube from the sterilizer
- Remove the lower blocking bar
- Turn the container with the large opening at the top
- • Remove the cover



### 3. Digestion

Digestion is done by beating the fruit with pestles by more people at the same time, for about twenty minutes.

Part of the fruit can be pounded directly in the same container, but another part must be removed from the container and pounded in other mortars. During digestion place a bucket under the container to catch the oil.

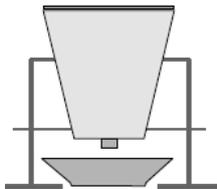
At the end of digestion, we have vegetable fibers mixed with the kernels.

To separate them you can use a kind of "canoe", or an excavated tree trunk, in which to throw the balls of fibers. By placing the canoe tilted, the stones roll towards the lower end and can be collected in a basin.

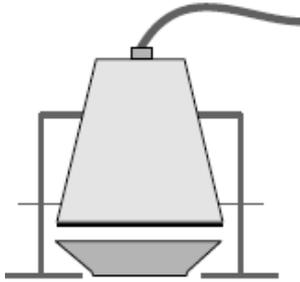
### 4. Pulp Heating

The digestion operation has cooled the pulp, which must be warmed further before pressing it to extract all the oil. The same sterilizer is used by applying the same operations as in chapter 2.

#### First operation: filling the container with the pulp

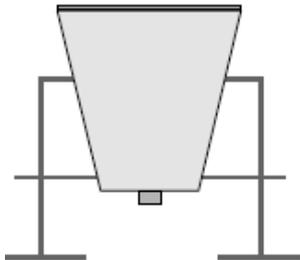


- Position the container with the large opening at the top
- Fix it using the lower bar
- Fill with all the pulp
- Put the lid on
- Remove the lower blocking bar



### Second operation: heating

- Turn the container with the large opening at the bottom
- Fix it using the lower bar
- Keep the bucket for the oil under the container
- Attach the flexible connection pipe to the boiler
- Open the valve from the boiler to the sterilizer
- Close the valve to the open air
- Check that the heat is high until the bottom of the sterilizer begins to release steam
- Continue to supply steam, over normal heat, for at least another 10 minutes.



### Third operation: emptying the container

- Open the boiler valve to the open air
- Close the valve to the sterilizer
- Detach the flexible tube from the sterilizer
- Remove the lower blocking bar
- Turn the container with the large opening at the top
- Remove the cover

## 5. Pressing

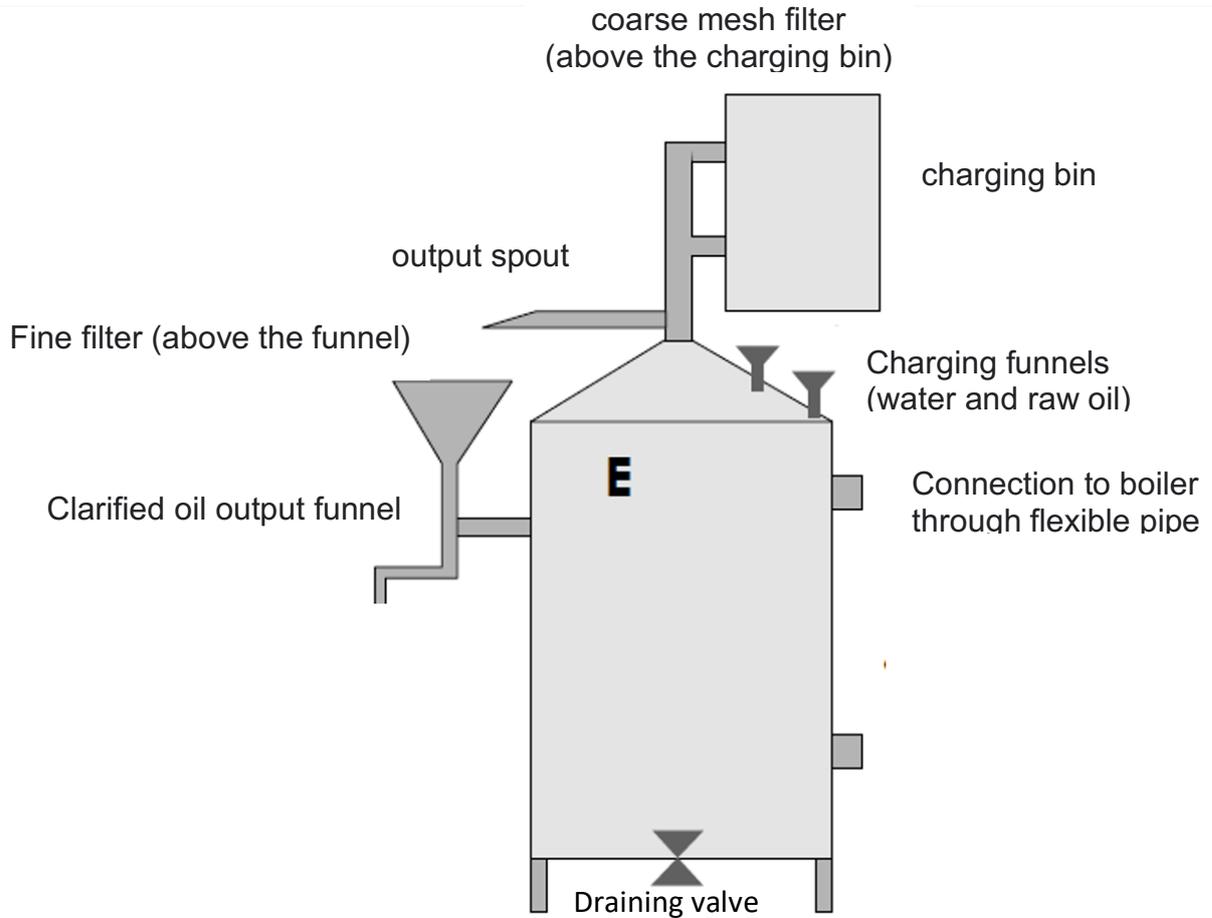
The press is smaller of the sterilizer and so one will have to use the press 3 or 4 times to press it all. In order to keep the pulp remaining in the sterilizer warm, the flexible pipe must be inserted over the container and a trickle of steam sent from the boiler to the sterilizer.

- Extract from the container a quantity of pulp to fill the press
- Squeeze the pulp in the press, collecting the oil in a bucket.
- Remove the pressed pulp and keep it for other uses
- Reload the press and press the pulp until the pressing is complete

## 6. Clarification

This is the last phase of production.

The loading of water and oil in the clarifier is done through the same container at the top. Above the container you must place a coarse mesh filter (0.8 mm). Above the oil outlet funnel, place a finer filter (0.17 mm)



- One hour before the start of clarification, pour 35 liters of water into the clarifier, then close the water loading valve
- Attach the flexible steam pipe
- Open the valve from the boiler to the clarifier
- Close the valve to the open air
- To obtain the necessary temperature, a low heat is sufficient.
- The oil loading valve must be open so as not to mix oil and water in the clarifier.
- First load the crude oil produced by flow during digestion and heating
- Then load the oil produced by pressing, each time a pressing phase is completed
- Once all the oil has been loaded, load the water into the loading container and open the water inlet valve so that the water can flow out slowly (approximately 1 liter of water per minute)
- When clarified oil begins to flow from the outlet spout, reduce the water flow to the clarifier to approximately 1 liter every 3 minutes
- For the exit of the last part of the oil, pay particular attention to the spout outlet and when water appears, immediately close the water inlet tap
- Open the valve to the open air
- Close the valve from the boiler to the clarifier
- Clarification is now complete
- Clarified oil should be kept in non-transparent containers and with a cap for a good seal.
- Fill containers as much as possible to avoid acidification due to contact with air

## 7. Final operations

### **Preparation for the next day**

- A. Oven: remove the ash
- B. Boiler: drain the water, through the valve at the bottom  
close the valves at the top to the sterilizer and to the clarifier  
leave open, on the contrary, the valve to the open air
- C. Sterilizer: clean it inside with a damp cloth
- D. Press: must be emptied and cleaned of residues inside
- E. Clarifier: introduce water several times and let it out through the drain valve, to eliminate the mud remaining on the bottom

### **Operations at the end of the season**

Carry out all the operations as for the next day and in addition:

- dry all parts of the machine, paying particular attention to the inside of the clarifier
- protect the interior surfaces with a thin layer of oil
- cover all parts to protect them from the rain.



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