

# A COMPLETE GUIDE ON HOW AN OLIVE MILL OPERATES

(by Maggie Scott)

## INSTRUMENTS FOR OLIVE PICKING



**Comb for manual picking**



**Pneumatic comb for easy  
picking**



**Common ground sheets**



**Shaker machine at work**

## **BOXES FOR OLIVE GATHERING AND TRANSPORTATION**

The best way to conserve and transport olives awaiting to be pressed is in window boxes (Fig 5) which consent a correct airing for the olives, but the boxes must not be more than 20cm in height. Other systems are inadvisable (Fig.6 ).



**Picture Fig. 5 - Olive boxes conservation systems**



**Picture Fig- 6 - Non advisable**

***“DIRECTLY FROM THE TREE TO THE MILL => QUALITY”***

## **WASHING AND DEFOLIATION**

The olive washing and defoliation is necessary in order to get rid of impurities (earth, small stones, twigs and leaves) before pressing. These two operations are important, one for the quality of the product and the other to avoid the introduction of foreign bodies into the machines.



**Washing and defoliation machine**

## PRESSING

During the pressing process the different part of the olives (peel, pulp, and stones) are reduced to a paste; in some cases the olives are pressed without their stones. The olive pressing systems are: millstones, hammer crusher, crusher knives, crusher discs and stoners.

The Millstone (“Mollazza”) was the first pressing system; in some cases still used today, the oil obtained has sweet connotations, and it’s difficult to find piquant and bitter hints and this is attributed to the elevated time that the paste is exposed to air.



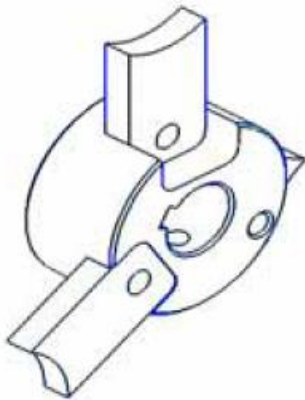
**Picture Fig 7 - Millstone**

From the hammer crusher you obtain a good product but there has to be a particular attention to the type of olives pressed, if excessively green or particularly rich in polyphenols the risk is that you obtain an unbalanced oil as far as the aromatic profile is concerned.

The knife crusher (Fig.9) instead gives balanced enough oils compared to the hammer crusher. The disc crusher (Fig 10) gives very balanced oils not excessively rich in polyphenols, however the paste obtained doesn't give the same degree of grinding/crushing.



**Picture Fig 8 - Hammer crusher**



**Picture Fig 9 - Knife crusher**



**Picture Disc crusher fig. 10**

The Stoner (Fig.11) is a rotating paddle machine that compresses the olives against a fixed grid with a cylindrical diameter of set holes, the rotation speed is low (900 average rotations/min), doing this the paste is separated from the stones which are then entirely recuperated; in this case the operation is less violent with respect to the crushers.

The oil obtained has:

- a. lower acidity free
- b. lower peroxide number
- c. improved oxidation resistance
- d. increased content of phenolic antioxidants

Quality wise de-stoned oil is different from other oils, it tends to be harmonious and balanced.



**Picture Fig.11 - De-stoning machine picture**

## KNEADING

The kneading process consists in a gentle, continuous and prolonged mixing of the olive paste in order to make it homogeneous and facilitate the separation of the oil thanks to the increase in size of the oil droplets Tab.4

**Tab. 4 - Variation of the percentage of oil droplets with different diameters in function of the crushing and kneading operation.**

Fase di lavorazione	Diametro delle gocce di olio (micron)					
	<15	15-30	30-45	45-75	75-150	>150
Dopo la frangitura (%)	6	49	21	14	4	6
Dopo la gramolazione (%)	2	18	18	18	19	25

Taken from the book “ Food and Agriculture Industries” G.G.D’Ancona.

To preserve quality, timing, kneading, temperature and air exposure are very important.

The kneading or mixing machines are of two types, vertical and horizontal (Fig.12) (Fig.13).

The vertical kneaders have the advantage of having a reduced surface area exposed to air or they can even have the sealed type with vent valves or with a device for inert gas use, thus allowing to extend the kneading time (60-90 minutes) without causing any particular problems regarding the quality. Indeed it was found that the longer the kneading time is produces a greater extraction of polyphenols.

With the horizontal kneaders there is a wider surface area exposed to the air, it’s more difficult to make them airtight and to use inert gases. The kneading time is reduced (max. 30-40 minutes), on the contrary you have a good kneading process.



**Picture Fig.12**

**Vertical kneaders**



**Picture Fig.13**

**Horizontal kneaders**



## EXTRACTION

This operation consists in separating the oil present in the paste. The actual extraction systems are those of pressure, spinning system (with decanter) and the percolation system (sinolea system).

With the pressure system (Fig.14) the paste/pulp is collected in a series of filter layers (made of natural or synthetic fibers called rushers) and stacked on a board where they are subject to pressure. The extraction time is very long, there is an elevated surface area exposed to the air and the cleaning of the “fiscoli” (rushers) is extremely difficult.

The product of the pressure system is an oily must, made from water, oil and a large number of impurities and it's for this reason that a system of centrifugation is necessary after the pressure extraction.

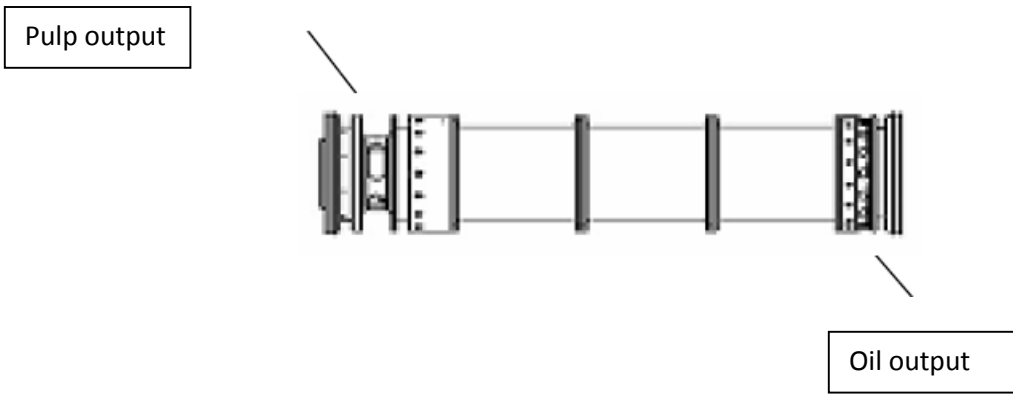


**Picture Fig.14 - Press  
(Rushers)**



**Picture Fig.15 - Fiscoli**

The decanter system is based on the principal of centrifugal force, in this case the paste is placed inside the decanter (horizontal axis) which rotates at a speed of about 3200-3400 rotations/min, in the individual phases ( paste, water and oil are immediately separated).



Picture Fig.16 - External view of decanter.

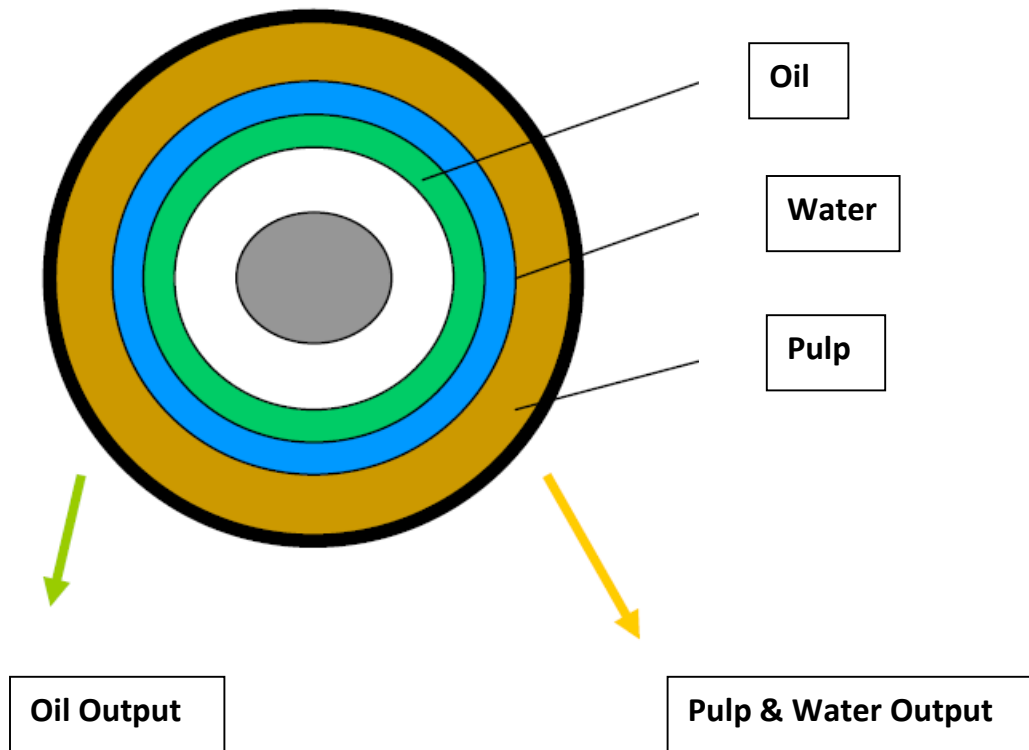


Fig.17 - Decanter sections picture

If the decanter has three outputs ( phases) the extraction you will get is on one side paste and on the other respectively water and oil in this case a final separation is necessary.

If the decanter is the type with two outputs (phases) on one side you get a humid paste and on the other only clean oil this way there is no need for a final separation.

In both types of decanters the oil spill occurs after having correctly adjusted the holes, nozzles and plates that are situated on the external drum, the purpose of the drum is that of making the right suction level of the oil.

The percolation system is based on the principal of oil coalescence or the ability that oil has to remain attached to metal.



**Picture Fig 18 - Example of coalescence**

Based on this principal a series of stainless steel foils arranged like combs move back and forth in the olive paste, continually stirring, sliding in guides formed in the filter walls; taking advantage of the different adhesiveness and surface tension of water and oil, the foils coming out bear only oil that is deposited in the collection tank by gravity dripping; the very fine steel foils exiting avoid lugging behind paste and water residues with particular cleaning systems. The surface adhesion is very high, over 5100 foils for a total area of 1.18 cubic meters, (with capacity equipment of about 300kg. of paste). Treatment time is on an average of about 30 minutes. The oil extracted with this system is of excellent quality, the inconvenience is the very long extraction time, the low quantity of oil extracted max. 60%, therefore a further extraction treatment is necessary or by pressure or by centrifugation.

## **FINAL CENTRIFUGE/SPINNING**

The final separation of the oily must ( extracted by the pressure system or by the decanter with three outputs ( three phases) takes place by means of centrifugal separators with vertical axis (Fig.19) that work according to the principal of centrifugal force.

The aim is to separate the vegetation water from the oil, and also to remove the bigger pieces present in the oil must (residual paste and mucilage) the rotation speed is about 6500 rpm. This further process helps to decrease the content of minor compounds (mainly polyphenols) in the final product, therefore decreasing the shelf life of the oil.



**Picture Fig - 19**

## FILTERING

Once the oil is extracted it has to be filtered. This operation allows you to remove any oil mucilage, which if left in contact with the oil for too long would give an unpleasant taste and smell. To implement this operation it is advisable to use cardboard filters (Fig.20) that give an excellent filtration alternatively cotton filtration is *advised*.



**Picture – Fig. 20**