

Alfa Laval PANX range of decanters for crude palm oil

High-performance three-phase decanters centrifuges



Applications

Alfa Laval developed the PANX range of three-phase decanter centrifuges especially for processing crude palm oil, focusing on efficient, reliable separation of liquid, dry solids (cake) and oil for maximum oil recovery with minimum oil losses. The PANX range therefore includes decanters suitable for every size of palm oil mill, from 30 to approximately 90 tons of fresh fruit bunches (FFB) per hour, and for a variety of crude palm oil applications. These include:

- Combined clarification and purification of pressed oil as part of the Alfa Laval D3 PRO all-in-one process (no need for settling tanks and dilution water), This provides high oil recovery with low water consumption and effluent level.
- Sludge treatment after separation of diluted palm oil in settling tanks, using the three-phase units as an alternative to a nozzle separator. The decanter efficiently separates the slurry into oil, water and solid cake phases.
- Oil recovery from empty fruit bunch liquor (EFBL) immediately after pressing. The high-quality palm oil recovered after separation and removal of impurities with a decanter can be mixed with the freshly pressed oil.

Benefits

The design of Alfa Laval PANX decanter centrifuges provides multiple operating benefits:

- More cost-effective separation of palm oil
- Up to 30% savings on power consumption as a result of an innovative liquid outlet design
- Improved solids dryness, ensuring lower costs for drying or disposal
- Increased capacity within the same space (or less), for a smaller investment.

Design

The Alfa Laval PANX decanter centrifuge range is designed to ensure easy access, good reliability and low maintenance costs. The rotating assembly is held at both ends by bearings mounted on a welded box beam frame. It is enclosed in a casing comprising a semi-cylindrical hood and a bottom section welded to the frame. The cover is hinged to ensure easy access. The bottom section incorporates the solids discharge funnel and the liquid outlet.

Design features and benefits

Low-, medium- and high-capacity PANX three-phase decanter centrifuges are designed for efficiency, simple installation, easy maintenance and ease of operation. Special features include:

- High performance combined with low energy consumption
- Critical parts made from wear-resistant material
- Control system – Basic Automation – that makes operation simple, with easy control and optimization of the dryness level of the solids phases
- Compact, modular design that saves space.

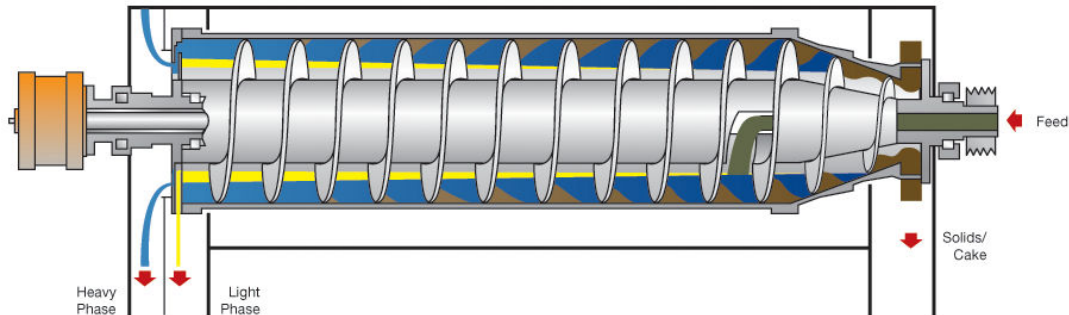


Figure 1. Cross-section view of the PANX decanter centrifuge

Working principle

Alfa Laval PANX decanter centrifuges work in the same basic way, regardless of the specifics of what they are used for. The separation of pressed palm oil, sludge from settling tanks or empty fruit bunch liquor into dry solids (cake), mill effluent (water) and recovered oil fractions takes place in a horizontal cylindrical bowl equipped with a screw conveyor. The palm oil product is fed into the bowl via an inlet feed zone which provides gentle, effective acceleration that results in fewer emulsions and avoids any tendency to plug up. Centrifugal force causes instant sedimentation of the dry solids on the wall of the bowl, and the liquid phases – heavy phase (water) and light phase (oil) – separate in layers.

The conveyor, rotating in the same direction as the bowl but at a different speed, moves the solids to the conical end of the decanter. Here, the solids are lifted clear of the liquid and centrifugally dewatered before being discharged into the collecting vessel.

The clarified liquids overflow into the casing of the decanter through an opening in the cylindrical end of the bowl. Both phases leave the collecting compartments in the hood by gravity flow through outlets under the machine.

Drive system

In all Alfa Laval PANX three-phase decanters the bowl is driven towards the conical end piece by an electric motor and V-belt transmission. Power is transferred to the conveyor via a planetary gearbox.

The speed difference is controlled in different ways, depending on the decanter type:

- PANX CT decanters feature a countershaft transmission, in which pulleys can be changed manually to optimize the differential speed
- PANX Basic decanters are equipped with an automatic back drive system for the main motor. By measuring torque, the VFD system optimizes the differential speed without changing belts or pulleys for an overall reduction of the power consumption.

Materials

The bowl, conveyor, inlet tube, outlets, cover and other parts in direct contact with the process media are all made of stainless steel or duplex steel. The frame is made of mild steel with an epoxy enamel finish. The discharge ports, conveyor flights and feed zone are protected with materials that are highly resistant to abrasive solid particles..

Automation

PANX decanters with variable frequency drive (VFD) are delivered with the Basic Automation system. This control package is capable of fully controlling operation of the decanter, including liquid clarification, solid dryness level, adjustment of process differential speed, automatic solid load and feed of incoming material. The Basic Automation control system ensures efficient performance and keeps installation, commissioning, operation and maintenance costs to a minimum. It is also designed to measure bearing temperature and to monitor the vibration levels.

PANX decanters with Basic Automation can be adjusted to suit specific process requirements by varying:

- Bowl speed to obtain the G-force required for most efficient separation
- Pond depth in the bowl for the most effective balance between liquid and oil clarification, while at the same time optimizing solids dryness
- Conveyor speed for most efficient balance, which minimizes the wear caused by abrasive solids
- Feed rate to handle a wide range of flows when operating with different types of solids and oil contents.

PANX CT decanters that have countershaft transmission are equipped with the Star-delta start-up system as standard. It is easy to change the differential speed of the conveyor by changing the back drive pulleys.

Flushing system

All PANX decanter centrifuge models (except PANX 350) are delivered with a flushing system that is set up for automatic flushing when the decanter starts and stops. This makes the installation less dependent on operator intervention.

Feed zone

The inlet feed zone provides gentle, effective acceleration that results in fewer emulsions and no tendency to plug up.

Wear protection

The new inlet feed zone provides gentle, effective acceleration, resulting in fewer emulsions and eliminating any tendency to plug up.

Wear is a fact of life for decanters used in palm oil mills. The rotating parts are exposed to abrasion by hard particles in the palm oil, slurry and empty fruit bunch liquor, especially at the inlets, outlets and – most of all – on the leading flanks and the tips of the conveyor flights. The following features are standard for all PANX models:

- Sintered tungsten carbide tiles mounted as tips on the flights of the conveyor prolong conveyor service life by a factor of five compared to other industrial-grade hard surfacing systems. This, in turn, reduces downtime and maintenance costs. The tiles can also be replaced on site, depending on the quantity. This reduces the need to bring the conveyor back to the workshop.
- Solids discharge bushings protect the solids discharge area. These are replaceable sintered tungsten carbide bushings. Abrasion is heaviest on the trailing edge and, with the specially designed 360° solids outlet with tungsten carbide bushings, wear is significantly reduced.
- Longitudinal strips of stainless steel provide optimum protection of the bowl wall. These strips trap a thin stationary layer of dry solids (cake) that then shields the bare steel wall from impact and abrasion from suspended particles in the palm oil, sludge or empty fruit bunch liquor.
- The solids-collecting cover wear liner protects the casing from the impact of ejected solids, at the same time as helping to reduce the noise level.

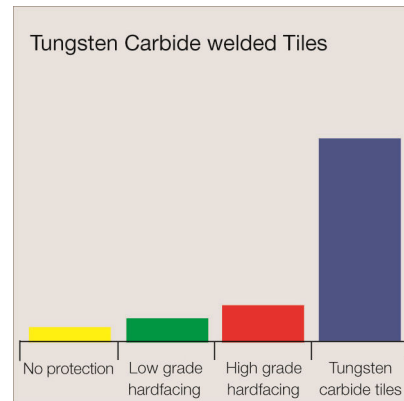


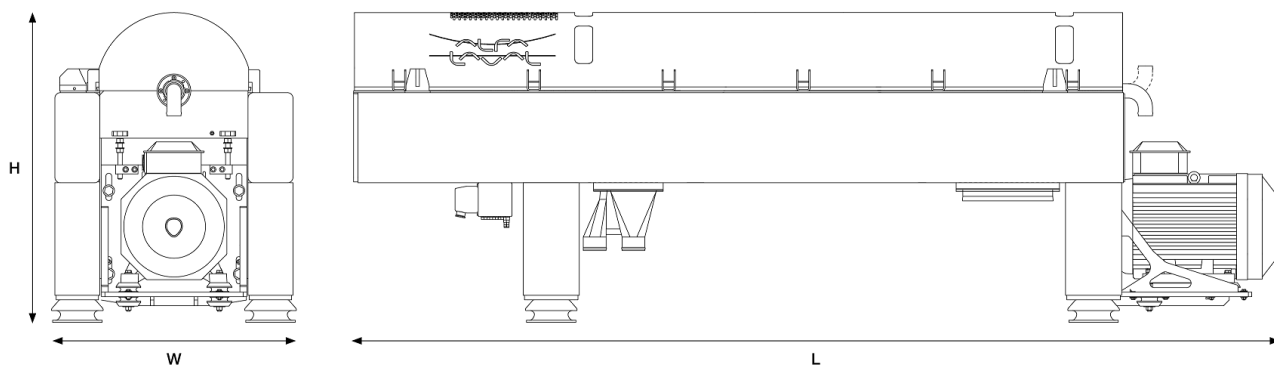
Figure 2. Relative protection with different materials



Figure 3. Close-up of the tungsten carbide tiles welded onto the flights of the conveyor



Figure 4. 2-Port feed zone



Dimensions

Designation	PANX 350 CS*	PANX 650 CS*	PANX 650 Basic	PANX 800 CS*	PANX 800 Basic
Length (L)	3540 mm	4185 mm	4890 mm	4925 mm	5635 mm
Width (W)	1304 mm	1376 mm	1376 mm	1190 mm	1190 mm
Height (H)	990 mm	1060 mm	1060 mm	1528 mm	1528 mm
Weight	2150 kg	3350 kg	3700 kg	4450 kg	4900 kg

*Countershaft transmission

Technical specifications

Designation	PANX 350 CS*	PANX 650 CS*	PANX 650 Basic	PANX 800 CS*	PANX 800 Basic
Capacity**	up to 30 mt FFB/hr	up to 60 mt FFB/hr	up to 60 mt FFB/hr	up to 80 mt FFB/hr	up to 80 mt FFB/hr
Motor	18.5 kW	37 kW	45 kW / 7.5 kW	55 kW	55 kW / 11 kW
Running up time	3 to 5 mins	3 to 5 mins	3 to 5 mins	3 to 5 mins	3 to 5 mins
Stopping time	20 mins	20 mins	20 mins	20 mins	20 mins
Back drive system	CS*	CS*	VFD**	CS*	VFD**

*Countershaft transmission

**Variable frequency drive

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