Feature Article

Practical Processing Hints

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PRESS CAKE CONVEYOR

A number of palm oil mills in Malaysia have this conveyor wrongly installed - yes even by experienced mill builders. The impact of this will be poor separation of nuts from the cyclone fibre.

NUT SEPARATION

Let us examine what happens when the press cake drops in the separating column. It drops down and makes a U-turn under the effect of the induced draught fan. The air flow velocity in the de-pericarp column is usually set at 16 m min^{-1}, the lifting velocity of small nuts.

At this velocity, the following materials with their lifting velocities in brackets are also sucked up by the I. D. fan and lost to the cyclone fibre:

- small kernel (14 m s^{-1});
- average shell (12-14 m s^{-1});
- small shell (10 m s^{-1});
- wet fibre (6 m s^{-1});
- dry normal fibre (4 m s^{-1}); and
- fine fibre (less tha 2 m s^{-1}).

Except for the first item all else may be deposited into the fibre cyclone but the kernel should be retained. Therefore, it is important to set the lifting velocity in the separating column at 14 m s^{-1}. I have not seen a single mill so far which really measure the air velocity in the de-pericarp separating column even though the measuring equipment is relatively inexpensive. It is certainly worthwhile to make this measurement once in a way due to the following:

- the fan blade gradually wears out reducing the air flow volume in the separating column, which in turn causes the lifting velocity to drop as it is governed by the equation, velocity v m s^{-1} = air flow volume V (M^3) / cross-sectional area of the column (M^2). When the air flow volume reduces due to a drop in fan efficiency caused by the wear of the fan blades, the lifting velocity drops and separation becomes poor. This is not to bad as the nuts and kernels are still retained in the polishing drum;

- what happens when the column-sectional area narrows down due to the deposition of fibre on the side walls? The reduced sectional area will give rise to a higher air velocity and

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there is a possibility of the small nuts being lifted up if the lifting velocity is in excess of 16 m s^{-1}; and

- the above two are still not as serious as when the press cake does not have sufficient drop in the de-pericarp column. If the drop is insufficient, the press cake does not have sufficient room to separate out in the separating column, an essential requirement for nut/fibre separation - a large volume of lumps of fibre will drop into the polishing drum. The modern press cake conveyors just transfer the press cake into the de-pericarp column without really loosening the nuts from the fibre as compared to the press cake breaker conveyor (with paddle arms) well suited for press cake issuing out from the now extinct hydraulic presses. The paddle arm type conveyor required high maintenance and as a result was replaced by the normal screw conveyor. But it cannot be denied that the paddle arm type was more efficient for the job and that is the reason the last section of the screw conveyor still has the paddle arms. Even with the paddle arm type conveyor, the drop of the press cake is critical. The drop should not be less than two-third the height of the separating column as shown in *Figure 1.* This allows the press cake to drop as much as possible before it takes a U-turn and allows only the fibre to be lifted up giving ample opportunity for all nuts and kernel to be left behind.

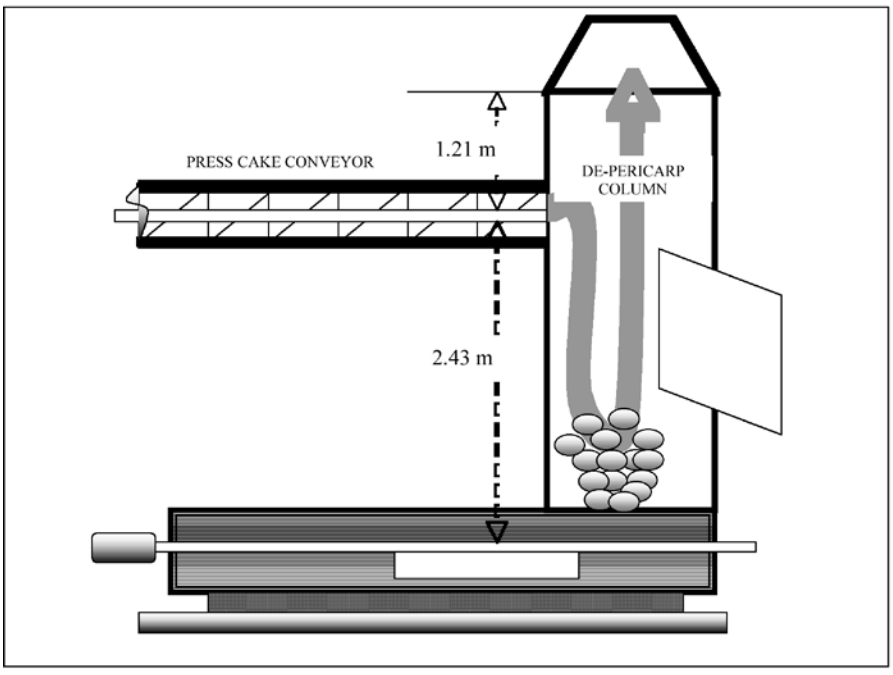


Figure 1. Dropping height of nut from the P.C conveyor.

HOW TO CORRECT THE DROP HEIGHT IF THERE IS NO SPACE

Many mills have managed to do this by inclining the whole conveyor so that the tail end manages to have the required two-third height as shown in *Figure 2*.

In almost all mills, it is extremely difficult to manipulate the velocity adjusting flap as it is operated by bolts that are very often jammed in a position originally set during mill commissioning. It may take a few artisans a few hours to adjust the position of the flap and even if an adjustment has been made, there is no equipment to measure the air velocity at the velocity box. It is therefore a sensible approach to introduce an easily adjustable flap that can be operated by one person using a hand wheel. One such gadget is shown in *Figure 3*. This can be made in the mill workshop and it is very easy to operate. If a velocity measuring equipment is not available then the best alternative is to observe any nut carry over in the separated cyclone fibre.

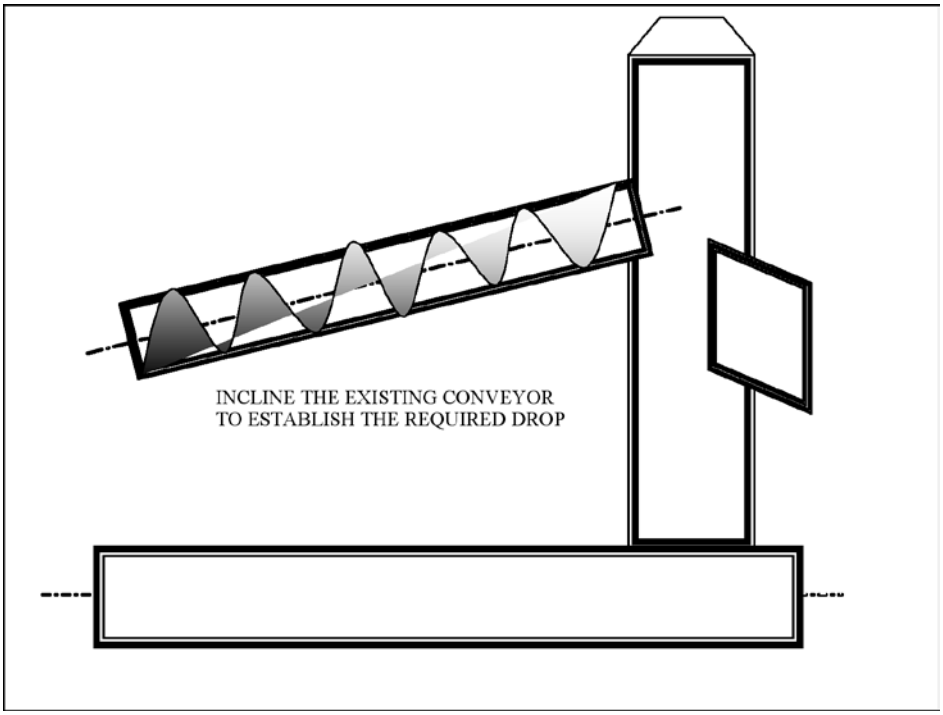
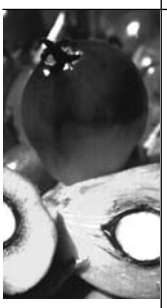


Figure 2. Solving the problem by inclining the existing conveyor.



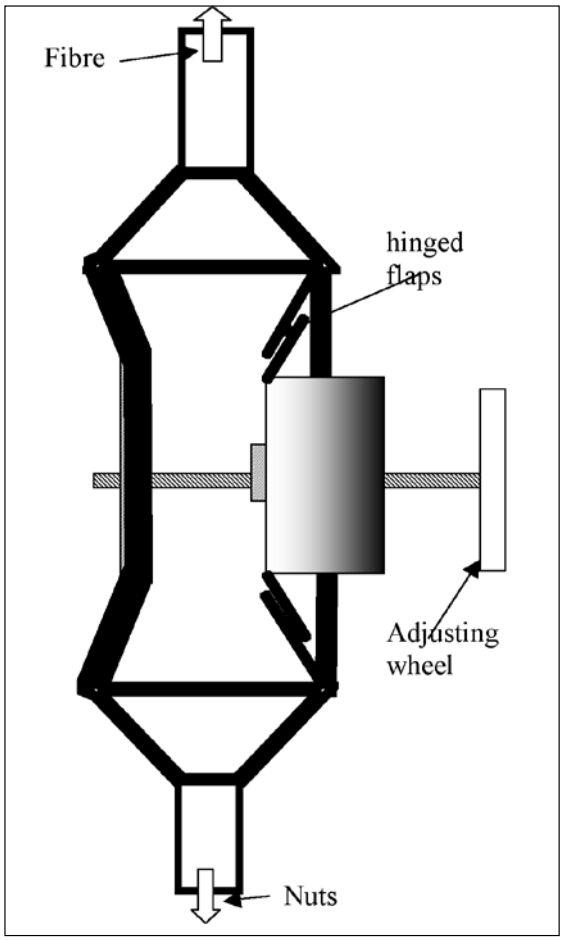


Figure 3. A simple method of adjustable flap construction.

NUT POLISHING DRUM

This is not an unnecessary equipment installed in a mill as some mills may think. It serves a good purpose in removing the fibre still attached to the nut as it issues out of the press cake conveyor. Removing this fibre will improve nut cracking efficiency as the nuts with too much attached fibre will produce a cushioning effect that may prevent the nut from cracking. The nut polishing drum should be as long as possible to effect good nut polishing. If it is too short, the nut polishing operation may not be efficient.