FILTER BELTS

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Why Will Changing The Filter Belts Improve Performance?

The belt press dewaters the sludge in two processes – gravity filtration or free drainage, and pressure filtration. As any operator will know, the sludge is first flocculated with polymer to separate clumps of solids (like snowflakes) from water. The flocculated sludge flows onto the filter belt and the free water drains through the belt, into a collection tray and out through an outlet pipe. The water leaving the belt press is called filtrate and this is typically returned to the wastewater treatment plant for further treatment.

When the filter belt is in good condition, the water drains rapidly through the belt leaving neat piles of drained solids to be carried into the pressing zone where it is squeezed between the rollers. However, with age the circular fibers in the filter belt begins to flatten and the spaces between the weave become smaller and smaller, giving the water less opportunity to drain away. This has the instant effect of sending wetter sludge through to the pressing zone, which generally results in a wetter final cake.

When a wetter sludge goes into the pressing zone, solids can squeeze out of the edges of the filter belt into the filtrate (which increases the cost of treatment as this load has to go back through the plant) and sometimes into the filtrate collection trays. If the trays are not cleaned regularly solids can build up to the point where they are totally packed under the filter belt resulting in even worse drainage! And so the cycle continues…

Naturally, when the drainage begins to deteriorate the operator responds in two ways – 1) by decreasing the load on the machine and 2) by increasing the polymer dose-rate. Both obviously push up the operating costs of the belt press. It is important to point out that this change happens so gradually that it may not be noticed at the time.

When To Change The Filter Belts

Since the sludge characteristics vary so widely, it is difficult to give a standard recommendation about when to change the belts. As a rule of thumb we recommend the following procedure:

STEP 1: At startup with new filter belts –

1. Record the sludge load by multiplying the cubic meters per hour of sludge multiplied by the % of dry solids in the sludge stream. For example, if the machine is running at 20 m^3 per hour and the solids content of the incoming solids stream is 2%, then the sludge loading is 400 kg's of dry solids per hour.
2. Record the solids content of the sludge cake.

3. Record the polymer dose-rate by measuring the amount of active polymer used to treat a ton of dry solids. This is normally done by measuring the drop in the polymer tank per hour against the sludge loading per hour.
4. Measure the filtrate quality by testing for the solids content per liter of filtrate.

STEP 2: After the first 2,000 hours of operation with the new filter belts –

Carry out all of the above tests and measure them against the startup results. It you see a deterioration in performance examine the filter belts for signs of wear. If the filter belts do not seem to have signs of wear you need to look for other reasons. (See troubleshooting article)

STEP 3:

If the filter belts are operating well after the first 2,000 hours comparative tests should be carried out every 1,000 hours of operation thereafter until a significant deterioration in performance is noticed, sufficient to justify replacing the belts.

Troubleshooting Tips

Question: "My belt press is not performing as well as it should be – what might be the possible causes?"

This is a typical question and there are a number of possible reasons for decreasing performance. If you are faced with this issue we recommend that you go through the following steps:

STEP 1: Look at the chemical dosing.

Compare the polymer dose rate required in the lab to produce a good strong floc with the dose rate actually being used on the press. If the dose rate on the press is much higher, it suggests a problem with the polymer preparation equipment, or more likely, a problem with the manner in which the polymer is introduced into the sludge stream. Perhaps the equipment is not mixing the polymer or giving it sufficient ageing time. Alternatively, the polymer may not be mixing sufficiently with the sludge leading to poor flocculation, or may be over mixing leading to breakdown of the floc.

STEP 2: Try Different Polymers.

Make sure that proper polymer selection trials have been carried out. It is important that your chemical supplier understands the requirement for a polymer, which will produce a mechanically strong floc that will resist shear. This is not necessarily the same selection as the polymer, which produces the best separation or settling.

Usually, liquid emulsion grades give a much better performance with secondary sludge. Typical good performers would be Cytec EXCEL or Allied Colloids Zetag 78FS40.

STEP 3: Take a hard look at the sludge feed pipe work and flocculent mixing.

Particularly for diluted activated sludge, look out for excessive turbulence, which would break up any floc formed. Also, make sure that the polymer is diluted to 0.1% final concentration or less.

STEP 4: Analyze the Performance

Definition of Overload:
When the solids loading on the belt press is such that the sludge extrudes from the ends of the pressure rolls.

Chances are this is a characteristic of the sludge and there is nothing you can do about it. This is the most difficult circumstance for the Plant Manager to accept. First of all try to reduce the belt speed to a minimum without overloading the belt press.

If you have selected the optimum polymer and are satisfied that the polymer is mixing correctly with the sludge, but the cake solids at minimum belt speed is not significantly better than at the higher speeds, then the sludge characteristics are such that it is unlikely you will achieve higher solids.

Problem: "The Cake Dryness is OK but Throughput is below expectations"

The most obvious possibility is that the throughput (which is measured in terms of solids loading i.e. throughput in m^3 per hour multiplied by the solids content of the feed) is in fact much higher, because the solids content of the feed is higher than you think. To ascertain this – test the incoming feed for solids content.

A **second** possibility is a buildup of solids in the filtrate catch trays beneath the gravity zone of the press. A buildup here will prevent free drainage of the sludge before it enters the wedge zone, and will lead to belt flooding and extrusion.

A **third** possibility is blinding of the belt fabric by excess polymer or by a high fat content in the sludge or perhaps because the belt washing system is operating below optimum. Pour clean water over the filter belt and if it does not drain the belt is blinded. Excess polymer in the flocculated sludge will also blind the belt. Check that the scraper blades are cleaning the belt – sometimes a buildup behind the blade prevents it from doing it's important job of cleaning the bulk of solids from the filter belts.

A **fourth** possibility is that, as the hydraulic loading on the machine increases, there is increasing turbulence in the feed pipe work system which is causing the floc to break up. This usually shows up as a sudden flooding of the belt with increasing flow rate, when the "turbulence threshold" is exceeded. It would be unusual for this problem to arise if the plant had operated properly in the past; however process changes (for example sludge bulking in activated sludge plants) can produce more fragile floc, which break up in high shear conditions.

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