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## HDPE scrap bottles washing and pelletizing

As written somewhere else in these pages, HDPE bottles washing is under the category of “easy to set up and run” systems.

And this is why:

HDPE is a polymer of olefins family and like other olefins floats in water (while all other plastic sinks).

This practically means separation of this polymer from other plastics is easy and inexpensive.

Let's start from the very beginning of what should be the right set up.

A bales breaker is almost compulsory if production rate is over 500/700 Kg/hour (1000/1500 lb/hour).

The reason for this is kind of easy to understand.

If you are in a country where operators cost is not very high, you can choose to go with manual bales opening even for higher throughputs but this is your choice.

Just remember a machine never get sick (unless it breaks), it works 24 hours a day without complains, doesn't ask for days off and so on.

Consider also this when you take decisions.

After bales is opened and bottles are “singularized” onto a conveyor belt, one operator should check for “strange” items, meaning a pair of shoes or a dead cat not to go to granulator, and this can be done with negative sorting.

It is only a “just in case” precaution.

So, all plastic bottles go under a Metal Detector to be sure no metal gets to the granulator and then to granulator itself.

The choice for the right granulator is a thought one.

HDPE, like most of plastics, wears out steel pretty easily and together with paper and dirt things are not any easier; this is the very first consideration.

A wet granulator is suggested, from our point of view, because of this reason first, and also because of the fact it is a good “pre-washing” machine, like any machine making friction in presence of water.

You may like better a dry granulator for the reason labels can be removed by an air separator way easier if dry. Keep going, we'll show you this is “almost” true.

Second, we have to choose the size of the holes grid; this doesn't automatically means you should go with the size you need at the end to feed the extruder.

The other choice is to run this granulator with a bigger screen, let's say twice as much than you need, run this size flakes through the line and then go into a “refining” granulator to downsize your flakes to where you want.

The objection could be two machines cost more, consume more energy, more maintenance and so on; not quite.

With a bigger screen on first one, the production rate increases a good 70/80% (with holes size double than whatever dimension it was decided to be) and this means the size of the machine itself can be a lot smaller, less energy consumption, less number of cuts and therefore less wearing.

Are you following ?

Another advantage is the fact the bigger the flakes (the less the number of cuts) the less amount of fines will be lost in the washing line.

And because this difference it can be as much as 2% it means, in a 1000 Kg/hour system, 20 Kg/hour, times 24 hours times 300 days, time the price you can sell your material, figure it out.

Never think about it ? Well, you better start now.

Anyway, we got our bottles converted into flakes now and here where the washing line starts.

Actually, using a wet granulator the washing process is started already because out of this machine we receive flakes with a lot of surface dirt already loose and most of paper converted to pulp by the combination of water and friction.

So it will be matter to separate this dirty water from the our valuable plastic.

The very best way to do this is by a centrifugal dryer; drying material and then put it back into water doesn't make a lot of sense you would say, but look at the advantages of this step.

A centrifugal dryer, once again, is a machine that makes a lot of friction, for few seconds, true, but still friction is and, again, together with some water.

Separating material from (dirty) water simply means to get rid of dirt right at the beginning of the line or, at least, of most of it.

The contamination we will find in our bottles will be, mainly, soap, milk, detergents and few other craps that will be soluble in water anyway, and this is what the filtration unit should take care of.

And because we set up the very first part of the system to remove most of dirt, we should have a dedicated filtration unit for this part of the system.

We'll talk about water filtration at the end of this page even if the subject is not the last one for importance.

Washing line now.

It may sound very obvious but a washing line MUST have a machine that washes plastic flakes.

As written quite many times elsewhere, washing plastic should be a combination of friction (the same way your wife brushes your T-shirt when very dirty), water, better if at least warm, and a certain amount of time under these conditions.

And, if this machine can provide also for water change during this time, you got what you where looking for.

To make this concept a little more clear, it is the difference between taking a bath or a shower.

In a bath you can wash yourself and then you need to get a rinse somehow otherwise it doesn't work out well while with the shower system you get washed and rinse at the same time.

Isn't it ?

Back to our washing line, we take our pre-washed flakes and fill them into this washing machine to "brush out" all sticking dirt that hasn't previously been removed, convert all paper into pulp, and take it out with the "shower" we were talking about a minute ago.

This "brushing" should be as long as it takes to get the job done.

In other words if material is heavily contaminated, or with some very difficult to remove dirt, time must be longer and this can be done with our machine just increasing one of the parameters.

At this point we have our flakes shining but it is not the end of the plant yet.

Two more steps to go.

First is separation of HDPE flakes from other plastics.

As we said before, all plastics other than olefins sink so separation into fresh water does the job pretty easily and because material has been (strongly) washed already, foamed materials are gone already because pulverized by the granulator, the centrifuge and the washing machine at the end.

The very last step, at this point is drying that, for bottle flakes, is not very hard to get.

We do suggest a powerful dryer that mechanically can remove all water and leave material with a mere 0.5% moisture content, without using any expensive hot air system.

Any vented extruder in this world can handle, at least. 1% humidity and therefore you are on the safe side.

End of washing line ? Almost.

The point is a washing line, any washing line, removes contaminants from the surface of flakes and this is what we were looking for, but dirt doesn't disappear and it simply goes into water.

Got the point ?So all the machinery we have installed are giving us a very good material together with a lot of problems with authorities that don't like we discharge our craps into the sour.

In other words, washing lines go together with a filtration unit, or more than one.

First step in fact, is to remove solids from water, and for solids we mean paper pulp, plastic fines, dust, you name it.

Second is to remove soap, detergents and whatever soluble contamination was mixed together the scrap bottles.

And may be also what we did use to remove foam, for example, because, as you know, soap makes foam and washing line should foam free to run well.

Because you are smart, you did use the simplest way to "de-foam" you water adding a glass of Diesel, and this works pretty well, doesn't cost almost anything and makes your material even more shining after extrusion but the problem is you just cannot discharge it. Period.

So, whatever you put in, needs to be removed before discharge, so you need to be very careful saying you found the way to skip the problem adding this and that.

The solution of course does exist and is a water treatment system that needs to be chosen according to each country rule, the cost of water, cost of chemicals that go with it and so on.

There is not a final answer to the problem yet because each situation is different and needs a "customized" approach and solution.