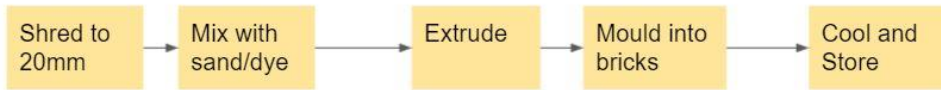


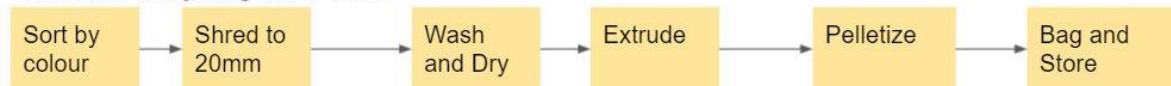
## Production Flow and Plant Design Considerations

### PRODUCTION FLOW DIAGRAM FOR BRICKS, PELLETS & FLAKE

#### HDPE/LDPE/PET and Sand Recycling into interlocking bricks



#### HDPE/PP Recycling into Pellets



#### PET bottles recycled into PET flake either washed or unwashed



Links to see these production lines

For the Shredder the following supplier from [India](#) meets the specifications of quality of steel in shredder blades and the quality of motor and sound proofing. 40" machine £10,225 ex works, £11,450 free on board at Nigerian Port. 32" machine, £8,034 ex works, £9,000 free on board at Nigerian Port.

Extruder 1 Sand and Plastic extrusion see potential [Russian](#) supplier. £15,340 ex works, £17,180 free on board at Nigerian Port.

Extruder 2 Pelletizing Line video from potential [Indian](#) supplier £12,615 ex works, £14,130 free on board at Nigerian Port.

Pet Bottle shredding, grinding into flake, not sound proofed.  
<https://www.youtube.com/watch?v=yRzOEx520Fo>

### Weighing/Sorting Area

The project will collect plastic already sorted into the categories. It will have to be weighed and quality controlled on arrival at the recycling plant. HDPE plastic will likely need to be sorted by colour as pellets are bought by colour. HDPE plastic is used to make bottles of laundry, shampoo, conditioner, household cleaning products, and motor oil. It is also used to make plastic toys. It is also used in milk plastic bottles, juice bottles, some bottle caps and in pipes. The sorted plastic will be held in Plastic Crates. There will be a need to remove bottle caps and labels before processing PET bottles if not done at Eco-Champion level.

### Washing and Drying Area

Both pellets and, usually, flake require washing and drying in their production. We have a buyer for unwashed PET flake (hence the question mark about washing and drying). Buying

a washer and dryer will open up more markets. But with the potential buyer for unwashed flake you could look at getting the washer dryer later after proving your collection. However the volume of PET flake they want to buy will be challenging to collect in Yola where the predominantly poor communities do not have much plastic bottle waste and where PET bottle collection will compete with existing waste pickers and aggregators.

### **Sand Storage, bagging and Mixing Area**

We will have to weigh sand on delivery and store it. This area should be adjacent to a delivery door where trucks with sand can deliver. The sand should be as evenly sized, fine, clean and dry as possible for a low supply price. A supplier of clean, dry, sieved sand has been identified. This area should not be exposed to wind in the open factory design so the sand does not blow around. It should be adjacent to the extruder area and the shredder area. As the sand storage area and the shredder area will feed into the extruder area for the production of bricks. Mixing is done by pre-weighed and pre-bagged sand and HDPE/LDPE/PET flake so that the proportions by weight can be maintained easily in the mix and the flow to the extruder can be maintained and controlled. Lake sand is the best sand where possible. If you can find a supplier for stone dust this can also be an interesting option for extra Research & Development.

### **Shredding Area**

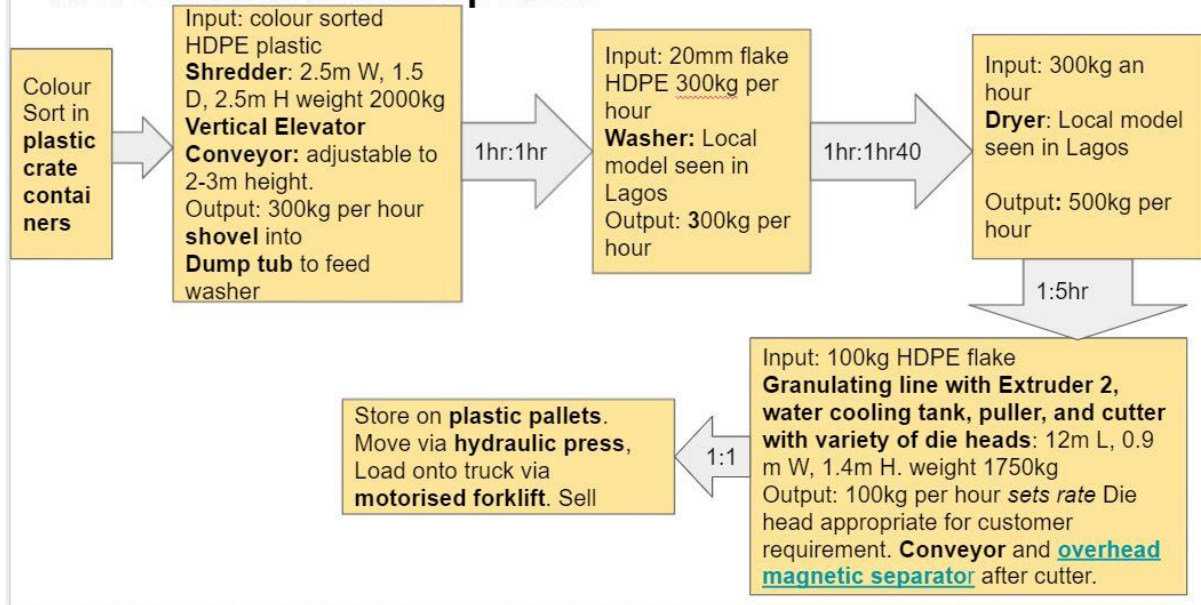
The shredder will be in constant use. The machine will be sound proofed but still noisy. The bagging and storing area for flake should be adjacent to the Shredding Area. The Shredding area should not be exposed to wind in the open factory design because the flake can blow away as it is being bagged. But flake entering bags or a hopper can be easily controlled. Simple adaptations using thick materials can help funnel PET or HDPE flake directly into the container of our choice.

### **Extruding, Moulding and Pelletizing Area**

The Extruding, Moulding and Extruding Pelletizing Areas must be well ventilated with fan ventilation and should not be exposed to dust being blown in due to the open factory design.

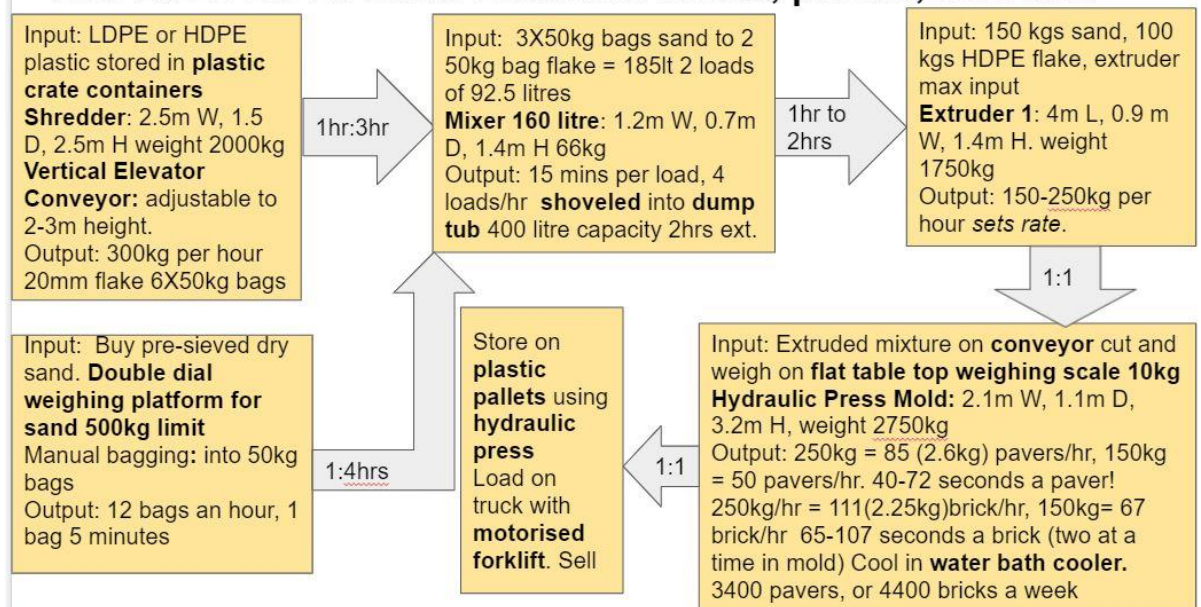
Space for the pelletizer should be included in this area as it attaches to the extruder and is similar in length to the extruder. Also as the Indian supplier above shows, the plastic may be strung along over some distance to further cool before being cut into pellets.

## HDPE extrusion into pellets



The hot sand plastic extruded mixture must be weighed before going into the hydraulic press which molds it into bricks. Thereafter the bricks will be cooled in a water bath cooler.

## HDPE/LDPE/PET Sand Extrusion bricks, pavers, roof tiles



This area should be adjacent to the Brick and Pellet Storage Areas on the output end. It should be adjacent to the Shredding Area and the Sand, Storage, Bagging and Mixing Area on the input side.

To create flexibility within the factory space the architects should consider using moveable stand alone dividers to break up the factory space and avoid / reduce dust contamination between production spaces? We can use the hydraulic pallet trucks to move machinery if some re-organisation of work space is required.

### **Brick, Pellet and Flake Storage Area**

This should be adjacent to a door giving access to 40 tonne trucks for loading. It should also be adjacent to the Shredder Area and Extrusion, Moulding Pelletizing Areas to minimize transport of products within the plant. The hydraulic pallet trucks will be used to manage the organization of this space. A ramp will be required for loading trucks arriving for onward sale and transport.

### **Wind Direction and Plant Design**

Predominant wind direction in Yola and local site topography should be taken into account when combining the open factory design and internal structures. The windiest months of the year are 19 January to 8 July. During these months the wind is predominantly from the North in January, February then predominantly from the West.