

PolyroxTM Technical Specifications

Website Version 1 Revision 1

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Product Description

Polyrox™ is the product of over 3 years of research and development. The Polyrox™ concept addresses the need in the construction industry for the production of high strength lightweight concrete, whereas the natural lightweight aggregates currently used for this purpose (such as scoria) are limited by strength and other limiting characteristics.

Polyrox™ will also allow for tighter water/cement ratios for greater cured strength.

A range of sizes suitable for inclusion in concrete to create a mix with reduced fines is planned.

The manufacture of fines out of Polyrox™ will also assist in achieving weights below 1800Kg per cubic metre of concrete.

Comparative Concrete mix designs (for Grade 40 Concrete)

	Large Agg.	Small Agg.	Cement	Water
Conventional Concrete	1200	620	380	200
Scoria Aggregate	610	710	440	260
Polyrox™	800	540	300	160

Note: The use of lightweight sands will reduce the weight of the fine aggregates.

Testing of Material

The Polyrox™ material manufactured in the laboratory has been tested in accordance with Australian Standards AS1141 for aggregate and has passed all tests with flying colours.

Testing of Manufacturing Techniques

Polyrox™ has been successfully tested in the laboratory, using an agglomerator. Successful field tests of several mix designs have been completed. The shaping machine is considered to be the best option for speed and cost, with machines available to produce 60 tonnes per hour. Labour costs can be minimised due to the automation of the various components of the production facility.

Manufacturing Concept

Fully automated manufacturing has been carefully planned and costed.

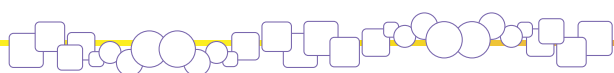
The process, in simple form, requires the mixing of dry Fly Ash with Dry Material in smaller amount and polymerisation by means of an alkaline chemical in liquid form in a continuous mixer.

The shaping technique in the production design is the preferred method of shaping the material into reasonably precise shapes and sizes. A heating cycle is required for a short period of time to remove moisture and achieve the required characteristics.

Proposed Production

A plant capable of 60 tonnes per hour is planned, designed to produce a minimum annual output of 100,000 tonnes in a 5 day/8hrs per day operation.

The same machinery used in a 2 shift/6 day production cycle can be expected to produce up to 250,000 Tonnes per annum.

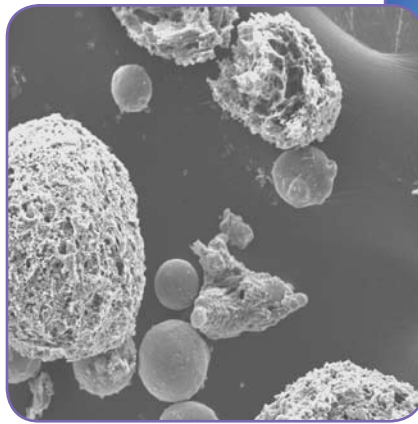


Comparative Weights of Materials

Polyrox™	Dry	1.54	SSD	1.75
Bluestone		2.6		3.1
Scoria		1.61		1.94

Grade A Polyrox™ Materials

1. Unclassified Fly Ash;
2. Dry Material;
3. Liquid Chemical;
4. Water.



Description of the Production Process

A dry mixture of the Fly Ash and Dry Material is introduced into a continuous mixer using a weigh batcher.

The formula for Grade A Polyrox™ is retained by the holder to the Intellectual Property.

Liquid chemicals and water are added to the mixer to achieve a very dry material suitable for compacting into the required shapes.

The discharged shaped material is heated to discrete and specific temperature to remove the moisture content. The completed material is then discharged by means of an elevating conveyor to the relevant stockpile.

From here the artificial aggregate is loaded to trucks for distribution in the same manner as any aggregate material.

Equipment Required

1. Silos for the dry materials.
2. Materials handling technology.
3. Liquid chemical tank.
4. Shaping machinery including integrated continuous mixer.
5. Oven/furnace.
6. Elevating discharge conveyor.

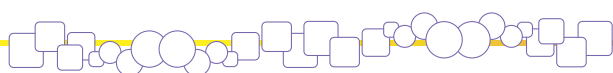
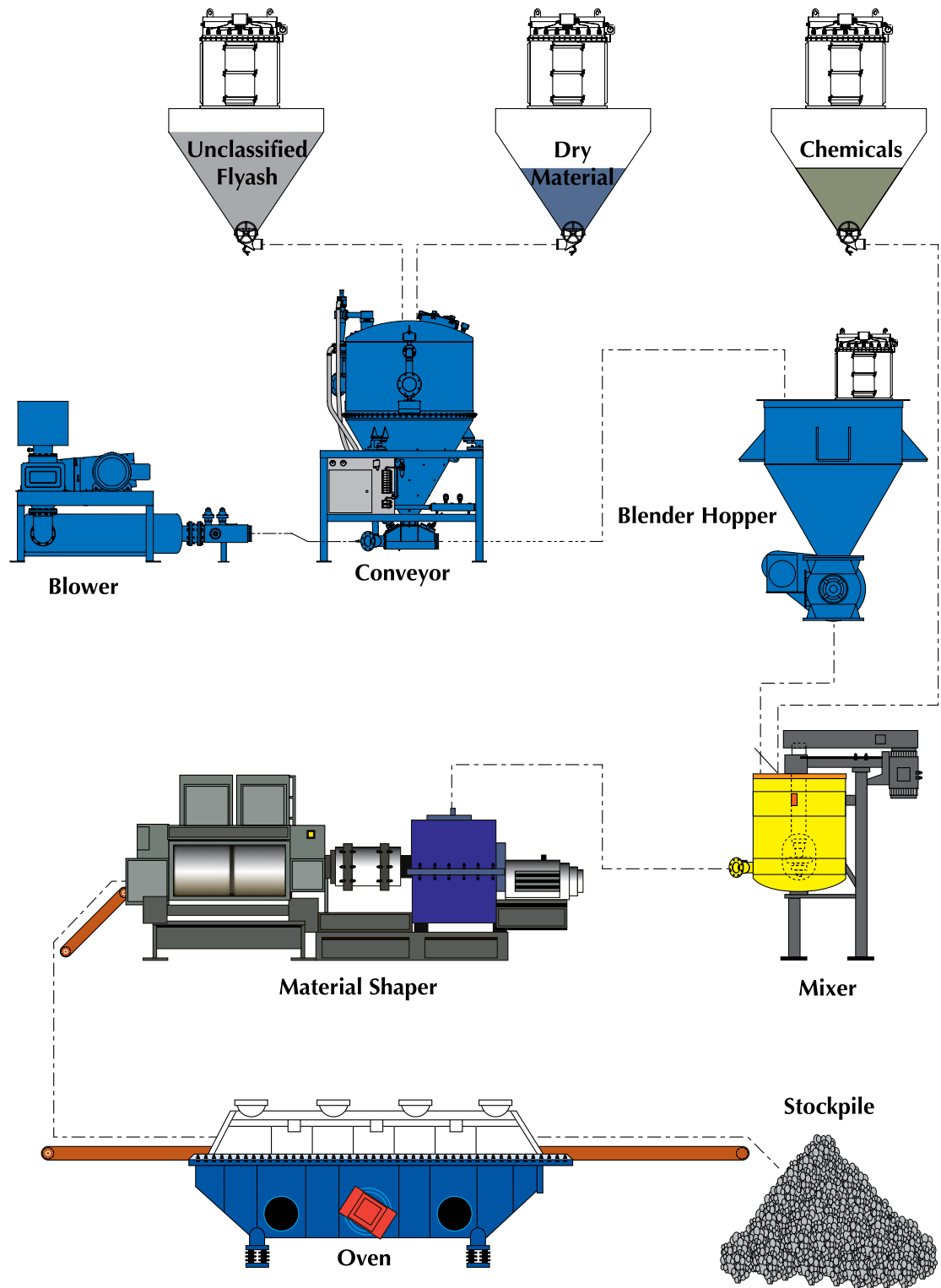


Diagram of Production Process



Material Shape and Size

The product is to be shaped as near to spheroid as possible, mindful of the limitations of the shaping machinery. A range of sizes can be manufactured. Manufactured lightweight sand is a strong and viable future product.

Original interest in the product included the desire for a defined particle shape. The reasons were related to accurate measurements of surface area of the aggregate in concrete, allowing for optimum and repeatable mix designs. The actual shape was not thoroughly determined so the hexagonal design was adopted for convenience in demonstrating the possibility of precise shapes.

We have always considered that differing sizes must be made to allow for varied and efficient concrete mix designs.

Although determination was made that a sphere gives the lowest surface area for a given weight of aggregate, a modified spherical shape allows for faster and cheaper production.

Spherical ovoids are not a lot greater in surface area, weight for weight, than spheres, however we can produce unvarying pellet size. A major benefit in throughput can be gained by using a modified ovoid (almond) shape.

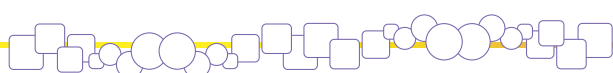
The production of small size Polyrox™ lightweight aggregate, down to 6mm grading can be incorporated into the production process.

The introduction of a small roll crusher into the production line will allow a pre-determined amount of the pellets to be reduced in size.

Adjustments built into the roll crusher will allow variations to the size of small aggregate.

After crushing, the pellets will be dried in the identical way as the full size pellets.

Smooth roller faced roll crushers are a widely available item, commonly used in mineral processing.



Process Timing and Size of Equipment.

- Target production rate in a typical Polyrox™ production facility is 60 tonnes per hour.
- The dry material silos will be of sufficient size to feed the machinery at a rate that requires the least amount of replenishment.
- The Fly Ash silo should have a minimum capacity of 500 tonnes.
- The Dry Material silo to have a capacity of 100 tonnes.
- Chemical storage of 1000 litres will be required.
- Water to be from the main supply.
- A conveyor oven/furnace must be capable of heating the product to the specified temperature at the rate of 60 tonnes per hour.
- The discharge conveyor is a relatively simple device as used in conjunction with any rock crushing plant.
- The plant is designed as modular, 10m x 20m demountable shed, clear spanned over the long dimension, on a concrete slab and clad in light-weight durable material.
This design will also be easily extendable and cost effective. Obviously the silos won't fit within this space, nor will the discharge conveyors.

Disclaimer

Although our design criteria is based on the laboratory assessment of the best possible product result, we need to analyse other tests that gave almost the same results but included differing chemical and energy amounts. In particular the use of a wetting agent in the mixture may result in reduced moisture content and therefore less energy requirements. These results will possibly affect the capital and running costs of our process.

The overall concept remains the same, however, the heating phase would be the only variable difference in design.

Assuming a stockpile of (say 4,000 tonnes) we require an area of 500-600 square metres. Some vertical divisions needed to separate varying sizes of aggregate (3 sizes).

The plant could occupy as little as 200 square metres.

Notes

1. The process developed will produce little or no pollution either by dust or chemical residue.
2. One of the selling benefits of the Polyrox™ concept is the reduction of cement used in concrete.

