



Green Sand Reclamation

A Necessity for Sustainability

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Reasons for Reclamation

The basic reasons for reclaiming sand are:

Economical

Economically, the foundries desire to reduce the total sand cost which includes purchase cost, freight cost, and disposal costs. While the purchase cost of sand has gone up by more than 40% in the last 10 years, freight costs have gone up by well over 125%. The cost of 1 ton of sand is made up of purchase price, freight, unloading cost, transport cost in the foundry, and finally disposal cost. In some foundries they must not only pay for loading and unloading discard sand, but after a long distance haul they must pay a dumping fee.

Environmental

Environmentally, green sand is not a very high risk pollutant as compared to the chemical effluents.

However, green sand does contain clay, carbon and sometimes acidic content. Solutions have been found to use the used sand for brick making or cement industry. Though this may make the foundry non-polluting from disposal perspective, however, it does not address the sustainability and indirect pollution & wastes. In India, there is no such established major use of the green sand, and we can consider the major sand is just dumped.

- Based on latest published data of Casting Production in India (2014), and a ratio of 1:1 for sand: casting, we shall need 10 Million MT Annual New Sand Procurement in India. Considering 600 kms average travel for a 20 MT/trip vehicle, it amounts to about 75 Million Litres of

Foundry per se are identified in majority by the sand process, as more than 70% of the castings produced today are by the sand moulding processes. Various processes of bonding the silica grains depending on the metal, weight, complexity and economics but all have one thing in common they all need new silica sand in varying percentages, and obviously need to dispose an equal amount.

Every day huge quantities of moulding sand are being handled in the foundries across the globe. It is estimated that for every 1 MT of Casting sold, 1 MT of New Silica Sand is required. Sand is seemingly among the most abundant materials on earth, yet like many other things that used to be inexhaustible, it is beginning to have an increasing value. Sand is not just sand to the foundry man but a specialized material that must be at the right place at the right time.

This degree of specialty, plus material handling, the timing factor and the cost to discard it are factors that give foundry sand a meaning and a cost. To stand in the international market it is necessary to produce the castings of superior quality at the least possible cost.

As the cost of the fuel, labour and raw material is galloping high the only area that needs to be concentrated is sand. Further dumping of spend sand causes environmental pollution.

Diesel, and 165 Million kgs of CO2 emission per annum due to sand transport from mines to foundry alone.

- Environmentally we are also talking of depletion of 10 Million MT of Sand due to Mining – we are disturbing our natural ecosystem. This was acceptable as long as options were not available.

Technical

Couple of years back the technical need of Sustained Consistent

Quality & Quantity of Sand was highlighted, when the mining was restricted in certain regions. The first impact was on the rejections of castings, and disturbance in managing the process.

For the foundry to be sustainable and consistent, the need of reclamation becomes very much important. There have been foundries who are importing sand from overseas – from China, UAE, Saudi Arabia and such other good sources to ensure that the casting quality consistency is not hampered. When it comes to quality aspect in rejection reduction and in aesthetic values, Sand has become an important factor in the casting production.

Rhino-FATA Approach for Reclamation

Rhino has always been an Innovator and Pioneer in bringing new technologies to India, which of late have also been recognised at the National & International Level. Apart from their thrust on Green Sand Mixing, Cooling & Control and High Pressure Moulding, Rhino decided to join hands with FATA in 2013, as they were the pioneers in this process of Green Sand Reclamation with more than 30 years of domain experience.

Rhino & FATA have analysed the complete demand need of the Indian industry in particular and rolled out solutions for different types and different capacities, segregated into 3 Distinct Reclamation areas (catering to more than 70% of the foundries).

Areas of Reclamation & Rhino-FATA Solutions

Green Sand Reclamation for use in Green Sand Moulding Process (S1 Process)

- The plant will receive the waste/discard green sand from the foundries, process the sand, remove impurities and waste from the sand such as the sand becomes good to be reused for refreshment in the sand mixing.

- The process is techno-commercially been established by setting up a pilot plant at Rhino in 2015, and then commissioning the first plant in India at Aquasub Engineering, Coimbatore, where already 50% of the new sand has been replaced with the reclaimed sand.

- Rhino has taken trials and tests for various foundries including Brakes India, Texmo Industries from Coimbatore, Sharp Chucks from Jalandhar, Siddhi Ferrous from Silvassa and working on the implementation in the foundries in India.

- Rhino has provided expert advice and guidance to the foundry on use of the sand in their system.

Thermal Reclamation for Cores/No Bake Process (S2 Process)

- The plant will take core lumps, no bake plant sand, shell sand, or any such chemically bonded binder as input to the system.

- The sand will be treated thermally, calcinated and brought back to be as good as or better than new input silica sand.

- The sand reclaimed shall be usable for any of the sand processes in the foundry core making or moulding.

- Though this is not a new technology but still FATA has established 20-30% better fuel efficiency and is the supplier to General Motors, Nemak, Teksid and such other large firms.

Green Sand to Core Sand Reclamation (S3 Process)

- This is the MOST important area of Reclamation and having the maximum need. Probably 50% of the foundry sand has to go through this process.

- The intake shall be Green Sand as in S1 or a mix of Green Sand and core sand, which will first be mechanically treated in S1, then thermally

treated in S2, before a final mechanical treatment again in the S1 process.

- The output sand delivered shall be usable in the foundry for core making or moulding with properties similar or better than the new input silica sand.

RHINO-FATA SOLUTIONS – GRAPHICAL REPRESENTATION OF SOLUTIONS AVAILABLE

FIG. 1 : VARIOUS SOLUTIONS FOR SAND RECLAMATION

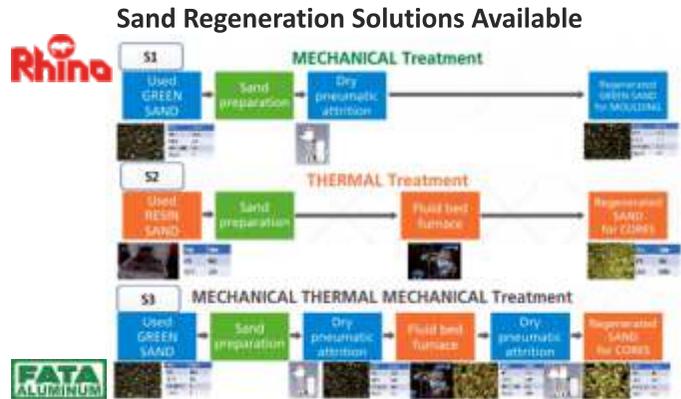
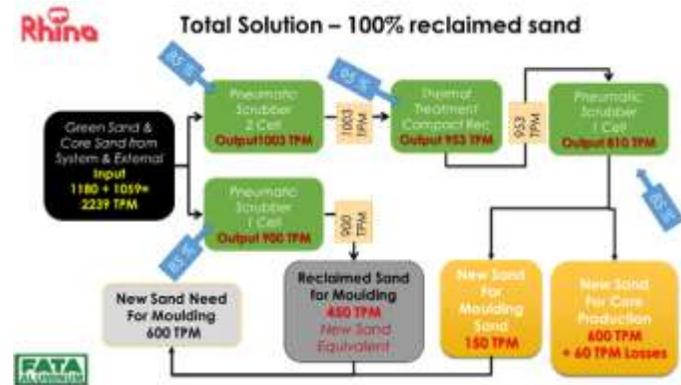


FIG. 2 : TYPICAL GREEN SAND SUSTAINABILITY SOLUTION



Case Study of 10 T/hr Green Sand Reclamation in Mexico

FATA Aluminum systems use a thermal process in combination with pre and post calcination mechanical processes having integrated pneumatic scrubbers. The overall system is made up of:

- Sand preparation;
- A preliminary mechanical process using a pneumatic scrubber connected to an exhaust and filtration system. This is used to reduce the bentonite level to an approximate 2% maximum level while eliminating the fines present in the regeneration mix;
- A thermal process. This is meant to eliminate organic substances and coal by combustion;
- A final mechanical process with pneumatic scrubber and fluid-bed classifier connected to the exhaust and filtration system.

Sand treated with this mechanical-thermal-mechanical system retain characteristics similar to those of brand new sand, and therefore can generally be used for all sand processes. The following is the data of results from Installation at TUPY Foundry in Mexico for their Block & Head Foundry.



FIG. 3 : INPUT PROPERTIES

DATA	VALUE
AFS	46,3
LOI %	3,6
ADV (pH5)	31
Clay %	9



FIG. 4 : OUTPUT PROPERTIES

DATA	VALUE
AFS	49
LOI %	0,07
ADV (pH5)	2,7
Clay %	0,22

The reclaimed sand has been used to produce Cold Box Cores on a continuous basis, with properties of core measured and monitored using 100% reclaimed sand. The characteristics have been found similar if not better than the use of new sand.

Concluding Remarks

The possibility of disposing waste product in landfills is becoming more constantly limited and therefore costly, and will finally lead to a situation in which it will be possible to use landfills "ONLY FOR UNRECYCLABLE SCRAP". Today in Europe or countries of higher income the cost of disposal and handling is enormous.

Though Saudi Arabia, Dubai and the Middle East Countries are in an area full of sand, it is the cost of processing, handling and disposing which will push the cost of sand higher than that in a country like India. The cost matrix of each country is different, and the ratio of cost of sand, fuel and person will vary.

However, the CO2 Emissions will be same, the reliability and availability of quality sand will still remain a burning issue. If a foundry has to sustain the need to reclaim is now a necessity and not a luxury. Fata & Rhino are committed to make the Green Sand Reclamation Viable from process & cost both using their years of complementing expertise in this domain, and request the foundries to



embrace, adapt and implement the Green Sand Reclamation for their long term sustenance, for making a small effort in the climate change prevention and for conservation of our natural resources.