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Automated Core Sand Preparation in Balanced Manner System

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ABSTRACT

This project presents the application of the process of core making in foundry. This process is used to mix the silica sand and two types of oils like resin and binder. The foundry sand mixer is very ruggedly constructed from heavy steel sections, with a fixer mixer blades and base frame. This system makes the proper mixing will brings the quality of composition. The composition makes the sand cores by machines with the aid of automation. This system brings reduces time , oil and composition wastages then the previous working method .but previous working method works in the process of grinder shape mixing that will mix sand and oil manually. If you do these things you will make some mistakes so that we are using automation process. The continuous motion is produced highly effective mixing. The main objective of automation is to eliminate human power and increase the production rate and profit of industries.

Index words: Sand Mixer, Blades, Foundry Sand, Composition.

INTRODUCTION

Now a day's automation process is increased in industries. So, the process is fully automated. The silica sand and two types of oils like resin and binder mixed with using mixer. The mixer consists of sand feeder, elevator, polygonal sleeve, screw feeder, load cell weight management and mixing blades. The Sand and oil ratio is 10:1. The sand mixer makes proper mixing composition and quality of shuffling process. The resin and binder oils are stored in an oil tank. Solenoid valve is use to supply of oils into mixer using air system. The composition makes the sand cores by machines with aid of automation. This process makes the proper mixing will brings the quality of composition. The motors are used to oil supply and move sand. The automatic system removes human error during mixing process. Our system reduces time, oil and composition wastages than the previous working method. The polygonal sleeve will remove the unwanted particles in silica sand.

The dust collector reduces the dust from the polygonal sleeve.

The screw feeder is used to transfer the sand to load cell weight management area. The squirrel cage induction motor used this process. Mixing process is finished then the sand composition out the Sand trolley. The sand trolley is used to distribute the sand composition of required machines. All process is controlled by programmable logic control programs. The sensors are used to sensing the objects and maintain the level of hopper sand safety purpose uniformly mixed sand gives high flow ability.

LITERTURE REVIEW

John Campbell, et al Inclusions of moulding sand are perhaps the most common extrinsic inclusion but whose mechanism of entrainment is probably rather complicated. It is not easy to envisage how minute sand grains could penetrate the surface of a liquid metal against the repulsive action of surface tension and the presence of an

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oxide film acting as a mechanical barrier. The penetration of the liquid surface would require the grain to be fired at the surface at high velocity, like a bullet. However, of course, such a dramatic mechanism is unlikely to occur in reality. Although the following description appears complicated at first sight, a sand entrainment mechanism can occur easily, involving little energy [1].

Johannes Karl Fink, et al In the manufacture of low nitrogen-containing foundry sands, the hexamine crosslinker is replaced partly with another crosslinking agent that does not contain nitrogen. Nitrogen, when present in coated foundry sand, can give rise to nitrogen defects during steel casting. It is preferable to have as low a nitrogen content as possible. Usually this other crosslinking agent is a thermosetting resol phenol/formaldehyde resin. During the manufacture of low nitrogen-containing sands, a novolak resin is added, followed by the resol resin and then the hexamine [2].

John Campbell, et al There are a few metallic impurities that find their way into moulding sands as a result of interaction between the cast metal and the mould. We are not thinking for the moment of the odd spanner or tonnes of iron filings from the steady wearing away of sand plant. Such ferrous contamination is retrieved in most sand plants by a powerful magnet located at some convenient point in the recirculating sand system. (The foundry maintenance crew always have interesting stories to tell of items found from time to time attached to the magnet.) Nor are we thinking of the pieces of tramp metal such as flash and other foundry returns. Our concern is with the microscopic traces of metallic impurities that lead to a number of problems, particularly because of the need to protect the environment from contamination [3].

Michael F. Ashby, David R.H. Jones, et al Sand castings are poured into moulds made of casting sand, a special sand mixture typically containing 90% silica, plus binders such as clay to hold the particles together (this is a major use of ceramics as refractories or heat-resistant materials). The first operation is to make a pattern (from wood, metal, or plastic) shaped like the required article. Sand is rammed around the

pattern, and the mould is split open again to remove the pattern. Passages are then cut through the sand (by hand) for in gates and risers. The mould is reassembled and the molten metal poured into the mould cavity. When the casting has gone solid, it is removed by breaking up the (fragile) sand mould. The casting is then fettled (which involves sawing off the in gate and what is left of the metal in the feeder) before (as is often necessary) finishing critical areas (such as bolting surfaces and bores for bearings) by machining [4].

CORE SAND AND OILS

The basic properties of core sand are

- Adhesiveness
- Cohesiveness
- Flow ability
- Dry strength
- Green strength
- Permeability

The sand which permits the steam and other gases to pass through the sand mould. The porosity of sand depends upon the grain size, grain shape, moisture and clay components of are the moulding sand. If the sand is too fine the porosity will be low. The silica sand is one type of casting sands.

The silica sand is most green sand consists of silica bonded with a bentonite water mixer. (The term green means that the mould, which is tempered with water, is not dried or baked).the composition, size, size distribution, purity, and shape of the sand are important to the success of the mould making operation. Sands are sometimes referred to as natural. Foundry sands are composed almost entirely of silica in the form of quartz. Some impurities may be present such as ilmenite, magnetite, which composed of manganese and ferrous orthosilicate. Silica sand is used primarily because it is readily available and inexpensive. The fine silica can give the respiratory troubles. Modern foundry sands are washed to remove the dangerous size fractions and do it present a hazard as delivered. It must be recognised, however, that certain foundry operations such as shot blasting, grinding of sand covered castings or sand reclamation can degrade the sand grains, producing a fine quartz dust having particle size in

the harmful range below 5 microns. Operators must be protected by the use of adequate ventilation and the wearing of suitable face masks.

Mixing oils

Invention relates to foundry products and foundry processes. In another aspect, the present invention relates binder compositions useful for core making process which harden at room temperature. In still another aspect present invention relates to combinations of a foundry aggregate, such as sand, resin, and binder based on phenolic resins and polyisocyanates which, on being formed into coherent mass with the aggregate, is capable of being cured at room temperature preferably by the use of gaseous curing agent. In the foundry art, cores for use in making metal castings are normally prepared from the mixture of an aggregate material such as sand which has been combined with a binding amount of resin and binder. Frequently minor amounts of the other materials are also including these sand mixtures.

Example iron oxide, ground flax fibers and the like. The binder permits such a foundry mix to be shaped into desired form and there after cured to form a self-supporting structure. The binder compositions of the present invention are generally made available as a two package system comprising the resin component in one package and hardener component is another package. The resin component comprising an organic solvent solution of a nonaqueous phenolic resin which can also contain the metal join in catalytic concentration. the hardener component is comprising a liquid polyisocyanate having the two isocyanate groups per molecule. Typically sand is used as the aggregate material. After the sand , binder and resin have been mixed ,the resulting foundry sand mix is rammed , blown otherwise introduced into a pattern. There by assuming the shape defined by the adjacent surfaces of pattern. The hardening can be accomplished in the original pattern. The resulting foundry mix is moulded into desired shape. The moulded structure is treated with a tertiary amine.

DESIGN SET UP

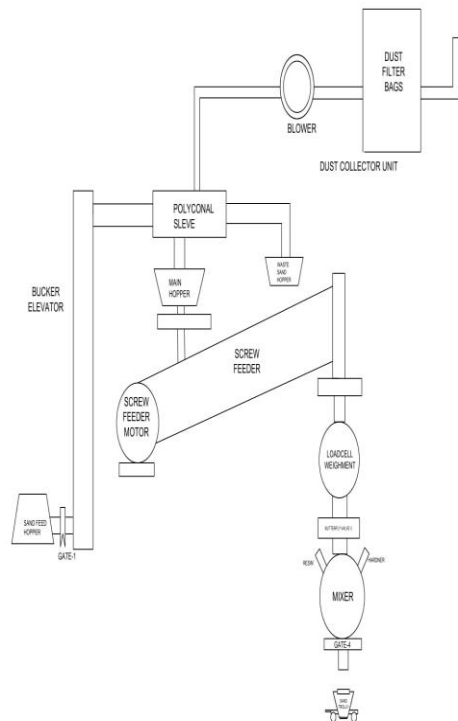


Fig. 1 Design Diagram

WORKING PROCESS

Sand feed hopper is filled with sand by using chine. Whenever main hopper level is below the lower level sensor, the gate 1 will be open. This gate 1 will open condition till the main hopper sand level reaches the high level sensor. These sand from sand feed hopper to main hopper will be moved with the help of bucket elevator. the sand before reaching the main hopper, it need to be cleaned. This cleaning process is done by the polygonal sleeve. From polygonal sleeve pure sand will be poured to main hopper. The stones and extra particles will be separated and stored in waste sand hopper. The dust collector bags and blowers are used reduces the dust from sand. When screw feeder motor is used to move the sand from screw feeder into load cell weight management gate. When load cell weight management is reaches the below contain level gate2 and gate3 will be open for pouring the sand from gate 2 to

gate3. Sand is transmitted will the help of screw feeder. This screw feeder is operated with the help of induction motor. Gate 4 will be open for mixing the sand with resin and binder .mixing of sand, resin and binder will happen on mixer. These resin and binder will be controlled by solenoid valve. These binders, resin will be in a ratio of 10:1. When sand is mixed then mixer will be opened when the trolley is reaches the home position also trolley closing signal attains. When the trolley is not attain home position the mixer will be not open for pouring the mixing composition. This process will be continuous. All process controlled by using PLC.

Screw Feeder

Screw feeder is a mechanism uses rotating helical screw to move sands. The rotating part is called auger.

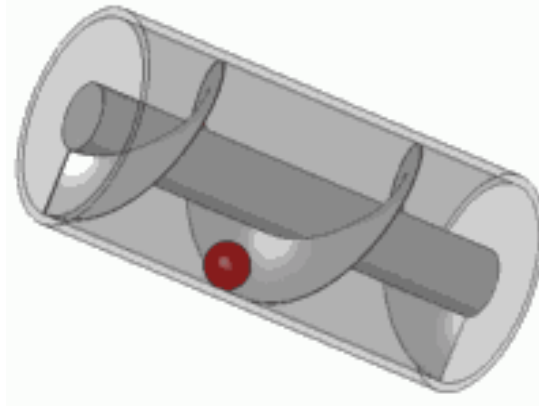


Fig. 2 Screw Feeder

Dust Collector Unit

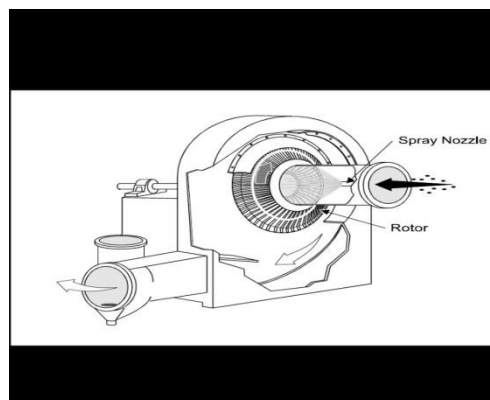


Fig. 3 Dust Collector

This is new technology to remove and reduces the dust from the sand mixer. The blower is

also used in this system. This is air pollution controlling unit in an industry.

Bucket Elevator

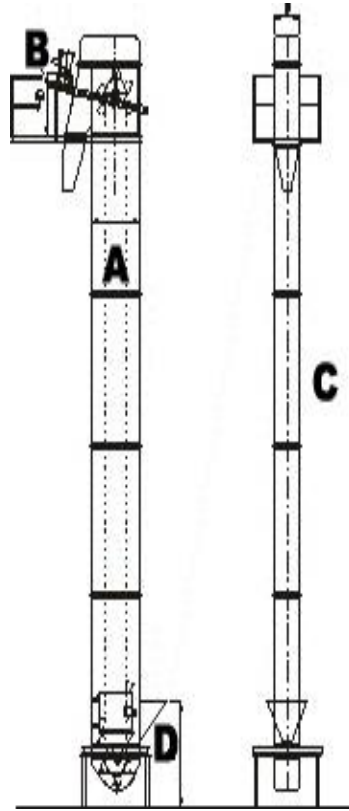


Fig. 4 Bucket Elevator

A – Moving up
B – Top end

C – Moving down
D- Lower end

The bucket elevator is used to sand preparation consist in large part storage and conveyor system. The features of bucket elevator is given below

- Optimum filling
- Little friction minimum wear
- Perfect discharge
- Silent quit run process

PROGRAMMABLE LOGIC CONTROLLER UNIT

A control device, usually used in industrial control applications that employs the hardware architecture of a computer and relay ladder diagram language. Inputs to PLCs can originate from many sources including sensors and the

outputs of other logic devices. Banner sensors and logic devices are all designed for ease of interfacing to PLCs. Also, called "programmable controller".

A programmable logic controller (PLC), or programmable controller is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, or robotic devices, or any activity that requires high reliability control and ease of programming and process fault diagnosis. They were first developed in the automobile industry to provide flexible, ruggedized and easily programmable controllers to replace hard-wired relays and timers. Since then they have been widely adopted as high-reliability automation

controllers suitable for harsh environments. A PLC is an example of a "hard" real-time system since output results must be produced in response to

input conditions within a limited time, otherwise unintended operation will result.

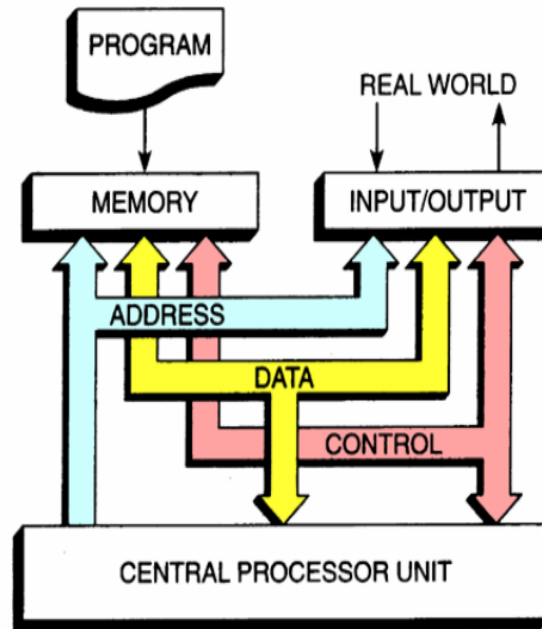


Fig. 5 Programmable Logic Controller Unit

Proximity Sensor

A proximity sensor is an electronic device that used to detect the nearby objects without physical contact. The proximity sensor has a principle of determinate sensing range, switching frequency and switching threshold. We can say that proximity

sensor is a device which detects objects nearby without any physical contact up to nominal range or sensor's vicinity. In brief, we can also say that Sensors which convert information on the movement or presence of an object into an electrical signal are called proximity sensors.



Fig. 6 Proximity Sensor

LOAD CELL



Fig. 7 Load Cell

A load cell is a sensor a transducer that converts a load or force acting on it into an electric signal. This signal can be a voltage change, current change or frequency change depending upon the type of the load cell and circuitry used.

RESULT AND DISCUSSIONS

By using our system, we can

- Increase the quality of composition.
- Decrease the error during mixing.
- Reduce the mixing and distribution time.
- Decrease the cost of production.

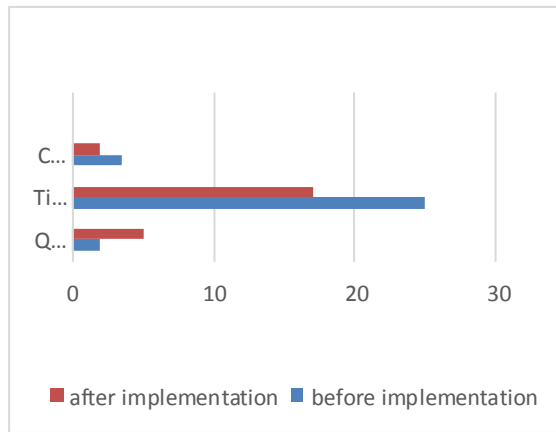


Fig. 8 Time, Quality, Cost

S.NO	Content	Before implementation	After implementation
1.	Quality	Decrease	Increase
2.	Time	25minutes	17minutes
3.	Cost	Increase	Decrease



Fig. 9 Increase Production Rate

CONCLUSION

In this paper a automated core sand preparation and mixing process for the core manufacturing process in foundry line. The proper

mixing composition is preferred using our project. To increase the quality of mixing and cores are produced in our system.

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