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Improving the effectiveness of cupola furnace with air blower

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This research was inspired by the need to enhance the design of air blower impellers and air blast intake structures in foundry industries in order to improve product quality, minimize energy costs, and reuse cast iron scrap metals in the country. This research is mainly focused on increase the rate of air flow and pressure of the cupola furnace. The design of this impeller is important with noise reduction and maximum efficiency. Therefore, different blade thicknesses (from 1.5mm - 3mm) and rotating speeds (from 2550 rpm – 2850 rpm) have been taken into the consideration. And also adjust the blade angle and number of blades. Then the four different model shapes of air blast intake structures are design. A model design is done for the numerical study using the software ANSYS Workbench. After that the effectiveness air blower was selected using the result of ANSYS Workbench. The results show that an impeller blade with a thickness of 1.5 mm produces less noise and vibrations at its maximum rotation speed (2650 rpm). Then fix the Air blower into the four different model shapes of air blast intake structures. After that the effectiveness air blast intake structures were selected using the result of ANSYS Workbench. The Static Pressure (981 N/m^2), Discharge flow rate ($0.5m^3/s$) and the Outlet velocity of impeller (42m/s) were calculated. Therefore, final design of improved air blast intake structures with air blower was more effectiveness than other three designs. It is advised that the design be used as a foundation for building better and cheaper foundry industries.

Keywords: Furnace, Impeller blade, Geometric parameter, Pressure, Centrifugal fan

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