Investigation of Gum Arabic and Its Suitability as a Composite Binder for Core Production

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E ect of gum Arabic composite binder on the production of cores

Table 1 gives some properties of Gum Arabic as a composite binder. e composition is varied from 13% to 15%, quartz sand varied from 84%-82% and water at 3%. As the binder increased both the Green and Dry compression strength were seen rising and falling. e rising of both strength is quite in order at 100° C, as it exhibits the characteristics and the binding strength of the binder as being used in foundry technology.

e e ects of increasing gum Arabic quantity on the binding

Composition	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Loi	Refractoriness	H_2O
%	95.96	2.04	0.92	0.06	0.08	0.02	1500°C	0.19

Table 7: Chemical composition of quartz sand in foundry shop of ASCL.

Arabic 13-15%, 84-82% quartz sand, and 3% water. As the binder quantity increased from 13% to 15%, the green strengths increase from 0.2 N/cm² to 0.5 N/cm² and, then reduced to 0.2 N/cm². e dry strength reduced from 4.0 N/cm² to 3.0 N/cm². e discussion above indicated that the composition of core mixture with Gum Arabic should be from 12% and above, when used alone and 3% water, but 4% to 6% is appropriate when used with other binders (Table 7).

e results of the experiment

- **t** Varying percentage of quartz sand from 90%-88% with Gum Arabic, 13%-15% could not produce bond; but when the quartz sand percentage was reduced to 84%-82% and using the same 13%-15% Gum Arabic these mixture produced adequate bonding.
- t In the core mixtures consisting of Gum Arabic and 5% sodium silicate, the quartz sand needed to be reduced from 90%-88% to 80%-78% before the result could yield bonding e ect. In this particular case, both the Gum Arabic and sodium silicate (Na_2SiO_3) were increased in percentage.
- t Core mixtures consisting of 12% of Gum Arabic could not be baked at 50°C, but with increase to 13-14%, and with 5% sodium silicate, the baking at the same 50°C was good.
- t Core containing 6% Gum Arabic binder with bentonite or industrial starch were brown and hard at 200°C
- t Each core particularly the core made from Gum Arabic has the characteristics of air setting when exposed to the atmospheric air for some minutes (60-90 minutes)
- t e inlet guide Gum Arabic cores exhibited excellent surface nish, with excellent shake-out characteristics. For the grey cast iron casting, the core material was easily removed by tapping the casting 2-4 times with say a ball Pen hammer. No other secondary core cleaning operations were required to observe the inside casting surface. e outside surface of the casting also had also had smooth nish because the core facing materials was made of Gum Arabic.
- t No much fettling work was done on the cast inlet guide. is is deliberately to show or reveal the features of the Casting. e defects were not remedied so as to show the true condition of the casting [8].

Conclusion

e research work investigated the suitability of Gum Arabic as a composite binder for foundry core production, it was obviously con rmed that Gum Arabic is suitable for foundry core production. Di erent types of experiments conducted, using varying quantities of Gum Arabic revealed that it is possible to produce cores for excellent inside casting surfaces, using Gum Arabic as a binder in the core mixtures. e cored surface, using Gum Arabic cores exhibited an excellent surface nish. On removal of the casting from the Gum Arabic mould facing material, the core exhibited an excellent shake-out characteristics, requiring minimal e orts. e use of Gum Arabic as a composite binder for foundry core production removes or reduces the risks of silicoses from foundry workers {since Gum Arabic are usually employed in food production}. It is however, likely that the limiting use of Gum Arabic as a composite binder for foundry core production lies on the di culty of procuring large quantities for big cores. Again the cost of large quantities of Gum Arabic places limit on its use, as the cost may be much higher than that of the same quantities of other conventional core binders. Nevertheless, for small size cores meant for limited number of castings, Gum Arabic is essentially suitable, especially where high inside casting surface nishing is required. Gum Arabic can make a good 'as cast products. On the removal of the casting from the mould prepared with gum Arabic as facing material, it was observed that it has excellent shake-out characteristics, requiring less e ort in knocking out of the moulds.

Gum Arabic has a unique air setting property which can dry at room temperature. Cores produced with Gum Arabic as composite binder exhibited excellent surface nish when used for castings. Cast products from the moulds prepared with Gum Arabic has excellent shake out characteristics, requiring less e ort in knocking out of the moulds. Gum Arabic does not constitute any health hazard as the risk of inhaling poisonous gases from the reaction of the binder with liquid melt is eliminated [9]. Grey cast iron melted at 1460°C produced with the core exhibited a good surface quality. Gum Arabic is therefore suitable for foundry core production. Gum Arabic does not constitute any hazard and Health as the risk of inhaling poisonous gases from the reaction of the binder with liquid melt. Grey cast iron melted at 1460°C produced with the core exhibited a good surface quality**.**

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