CHAPTER 5

CONCLUSION

From the results and discussions presented previously, it can be concluded that

(1) Properties differences between Thai resin and imported novolac resins are:

-The gelation time of Thai and imported resins are 44 and 61 seconds (at 150°C), respectively.

-The flow length of Thai and imported resins are 37 and 48 mm (at 125°C), respectively.

-The structure of Thai resin consists of *o,o′-*, *o,p′-*, and *p,p′-* methylene links of 27, 49, and 24%, whereas imported resin consists of *o,o′-*, *o,p′-*, and *p,p′-* methylene links of 61, 26, and 13%, respectively

Observed differences in gelation time and flow properties of the two resins can be explained in terms of the structure differences. Structure of imported resins is hyperacidity of the linear high *ortho-ortho* methylene linkage, while that of Thai resin is complex mixtures of random *ortho-ortho, ortho-para,* and *para-para* methylene linkages. These characteristics, in turn, affect bending strengths of shell mold. High strength could be obtained with resin of suitably low melt viscosity.

(2) A small scale sand mixer developed in this study can be successfully used to produce resin coated sand for the study of resin-bonded sands interaction. Consistent and reproducible resin mixes were obtained.

(3) Only slight difference between bending strength of experimental and that of foundry are found when high resin content is used. However, for lower resin content, the difference in bending strength becomes greater. This suggests that lower resin content mixes are more sensitive to mixing conditions.

(4) Comparison of bending strength of Thai resin and imported resin coated sand reveals that the bond strength values of Thai resin coated sand are lower than that of imported resin at the same amount of resin addition. This can be attributed to poorer flowability, lower viscosity, more stiffness with shorter gelation time of the Thai resin compared with imported resin.

(5) The bending strength also depends on the types of sand. The bending strength of resin bonded with reclaimed sand is higher than that bonded with Rayong sand. This reclaimed sand has smaller particles and rounded shape because Australian sand was mixed with Rayong sand in reclamation process.

(6) There is a direct correlation between bending strength and contact area of resin and sand bond as evidenced by SEM results and their quantitative analysis. The bending strength increases with increasing the contact area, and contact area increases with increasing amount of resin addition.

(7) Based on the standard formula used in one foundry, 2.7% by weight of imported resin with reclaimed sand, it was found that the bending strength of resin blends coated sand decreases with increasing % Thai resin addition. However, the resin blends of 80/20 and 70/30 imported resin to Thai resin possess the desirable bending strength of resin coated sand for used in Shell production.

(8) Experimental results demonstrate a possible cost savings of up to 30% of imported resin in shell mold production by effective use of resin blends as the binder in resin coated sand.

(9) In addition, cost saving can be made using 4.3% PSM-FD with reclaimed sand in shell mold production. However, this also depends on permeability of molds and cores which will influence casting quality.