CHAPTER 5

CONCLUSIONS

The adhesive production from CNSL as a resol resin for bonding of wood to wood was investigated. The quantity of formalin, refluxing time and condition for test specimens assembly were varied.

The optimum condition was obtained when the quantities of formalin was 20 per cent by weight to weight of CNSL. The amount of sodium hydroxide catalyst was 0.1 per cent. The method for holding two plywoods together was dry-laminating and 10 minutes cold pressing. The shear strength was 18.6 kg/cm^2. However, the shear strength of wet-laminating was 18.0 kg/cm^2. When the adhesive was dehydrating, it was less effective than the non-dehydrating.

In order to modify this adhesive, linseed oil and stannous octoate were employed. Linseed oil resulted in decreasing the shear strength whereas stannous octoate improved the shear strength to be 25.9 kg/cm^2. Morover, the dry-to-touch time was faster. The optimum concentration of it was 0.2 per cent by weight to weight of the adhesive. The 0.2 per cent stannous octoate-modified adhesive was stronger than the DYNO which was the phenolic adhesive used for bonding plywood, (DYNO, from Wanapan Th Thailand Co., Ltd.) but its storage life was less than DYNO.

Its resistant to water was poorer than that of standard defined by the Thai Industrial Standard Institue.

The best condition for producing hot setting adhesive from CNSL was 35% formalin with 10 minutes refluxing, and then dry-laminating with 30 minutes hot pressing. When it was applied to bond nylon-6 fabric to compounded natural rubber, the adhesion between these adherends was not better than the one without adhesive. Its peel strength was a little less than that of resorcinol-formaldehyde adhesive. However the CNSL was cheaper than resorcinol.

In conclusion, the adhesive from CNSL was better used to bond wood to wood than nylon-6 to compounded natural rubber.

From this investigation it should be studied further in the following aspect:

1. Substitute paraformaldehyde for formalin solution.
2. Substitute hexamethylenetetramine for formalin solution and sodium hydroxide.
3. Modify this adhesive by adding starch.
4. Use it in other applications such as coating and friction materials.
5. Apply it in bonding polyester to compounded natural rubber.
6. Blend it with rubber latex and study the effect on adhesion between nylon-6 or polyester and compounded natural rubber or other rubbers.
7. Study the conditions to keep it longer