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Studies on the Modification of Paper with Polyvinyl Acetate by Beater Addition, Emulsion Saturation and Solution Saturation

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The title of the thesis is "Studies on the Modification of Paper with Polyvinyl Acetate by Beater Addition, Emulsion and Solution Saturation". In the introductory chapter the purpose of the present study i.e. the modification of paper with polyvinyl acetate in the form of emulsion and solution by three effectiveness has been discussed.

In Chapter One the materials and methods have been described. Polymerization of vinyl acetate, preparation of paper and the treatment of PVAc resin by beater addition, emulsion and solution have been discussed.

In Chapter Two, a comprehensive description has been given on the measurement of resin retention, the influence of beating and other factors on the retention of resin and the state of polymer deposition as observed through the optical and electron microscopy. It has been seen that in the case of beater addition the retention of resin increased with the increase in the degree of beating as well as resin-pulp ratio, while in the case of both emulsion and solution saturation the retention of resin decreased with the increase in the degree of beating but increased with the increase in the solid content in the emulsion or solution. From the electron micrographic observations it was found that in the case of beater addition the resin is loosely held by the fibres and the precipitated tiny pieces of resin form minute bridges between two or more fibres or in other words the resin is held by the fibres somewhat like the ham in a sandwich. In the case of emulsion and solution saturation the function of the resin is to reinforce the cross-over points of the fibres and to cover the surface of the fibres and to fill the void spaces existing in the sheet.

In Chapter Three, various physical properties of the modified sheets, comparison of these properties of the sheets modified by the three different methods, evaluation of the effectiveness of these methods, and the absolute strength contributed by the resin alone have been dealt with.

In Chapter Four, a detailed discussion on the properties of the PVAc modified sheets and conclusions have been made. From these discussions it has been concluded that one needs to consider the effect of three most important variables (1) the degree of beating (2) the percentage of resin retention and the method of resin treatment to find out the most suitable conditions for the development of a particular or a number of the modified sheets to the maximum extent.

The consideration of these variables should be made on the basis of the object of modification. The merits or demerits of each of the three methods of modification were clarified by comparing these methods and thus the fundamental results for the industrial application were obtained.