



**HYDRODYNAMIC AND THERMODYNAMIC  
APPROACH TO CONVENTION OF DESIGN OF  
INDIVIDUAL EXTRUDER DIE FOR PRODUCTION OF  
SEMI RIGID PVC PIPES**

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## Abstract

The research was directed to develop a die for a semi rigid PVC pipe. Semi rigid PVC is widely used in washing machines as the outlet pipe. Washing machines are used in a number of factories located in Sri Lanka, belonging to certain industries including dyeing, protective clothing etc. Nevertheless dies for semi rigid pipes used in washing machines have not been produced or designed in Sri Lanka.

Theoretical approach in the project based on rheology and thermodynamics has enabled design of a die considering the processing limitations. Extrusion technology is used for manufacturing as it is the most suitable method in manufacturing continuous tubes. Plasticized PVC is used as the material, since the tube needs to be semi rigid. Selection of the material for the die is based on strength requirement of the process and physical properties of the material.

The project is done in two parts. Firstly to come up with a general solution package that can be used to derive the die dimensions when information about the input material and the expected pipe is given. Secondly, use the solution package to design a die using following information.

Input material - PPVC

Pipe - outer diameter 90 mm, inner diameter 81 mm

An Excel spread sheet is developed that embodies the theoretical aspects of the project. Changing the indicated input parameters, spread sheet calculates and produces the dimension of the die. A sequence of calculations and AutoCAD diagrams are produced for the specific die requirement.

With this information at hand, Sri Lankan industries can start producing dies for washing machine with a good theoretical base ensuring success, instead of importing semi rigid PVC pipes. Time and effort on R & D will be minimized as the die which is designed is based on rheological behaviour of the polymer melt.