

**DESIGN OF POLYETHYLENE BASED MULTILAYER
EXTRUSION BLOWN FILM FOR MANUFACTURE OF
LEAK FREE PACKAGING**

Nirasha Dilki Hettiarachchi

138257J

Degree of Master of Science

Department of Chemical and Process Engineering

University of Moratuwa

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgment is made in the text.

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***Dedicated
To
My Beloved
Parents***



ACKNOWLEDGEMENT

First and foremost I respectfully express deepest gratitude to my internal supervisor, Dr. Olga Gunapala, Senior Lecturer, Department of Chemical and Process Engineering, Faculty of Engineering, University of Moratuwa for the valuable advices, guidance and supervision extended throughout the period.

It's a great pleasure to thank, Dr. Shantha Egodage, course coordinator of the M.Sc in Polymer Technology degree for the dedication and effort she made.

I would like to thank Prof B.A.J.K. Premachandra and Staff Technical officers, Department of Chemical and Process Engineering for the persistent and generous help extended to me during learning period.

I would like to thank machine operators and Laboratory staff of Tuffline Ltd. for the finest support extended to me.

Finally I would like thank all those who, I was unable to mention for encouraging me and supporting me to make this research a success.

ABSTRACT

Key words : LLDPE sealant, leak free, seal through contamination

Flexible packaging is a growing market and the majority of flexible package applications are for the food industry. The demand for process optimization and reduced production costs has led to an increase in flexible packaging. And reducing wastage in production line, during storing and transportation is a critical aspect which food product manufacturers are highly concerning. These wastages are higher for liquid products packing flexible materials. That is due to contamination in the seal area. Most of the time liquid products are packing in Vertical-Form-Fill-Seal (VFFS) machines. Therefore seal through contamination is highly occurring while packing of liquid products. The study uses three types of liquid and semi liquid products such as tomato sauce, spicy oil and water based perfume. Since the aggressiveness of these products leak percentage is higher with current material structures. Hence target of this study was to develop a PE based blown film extrusion material which can be used for the laminate structures for these selected products. Newly developed Linear Low Density Polyethylene (LLDPE) was replaced the sealant material of existing structure of those products. Also all the tests were carried out for both existing material structure and new material structure with developed LLDPE. The existing sealant material was blown using 80% LLDPE and 20% Low Density Polyethylene (LDPE) in all 3 layers. But newly developed sealant material was blown incorporating Polyolefin Plastomer (POP) and metallocene LLDPE materials to the inner and middle layers. The study tests a combination of different sealing temperatures and dwell time to determine the optimal sealing condition. Then optimal sealing condition was applied to the production line in order to trial the material structures. Leakages tests were conducted to the packed sachets and final results were determined. Developed blown film extrusion LLDPE film was shown good results compared to the existing material. From new sealant material leak percentage of tomato sauce, spicy oil and water based perfume could be reduced by 20%.

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LIST OF ABBREVIATIONS

LLDPE	Linear Low Density Polyethylene
PE	Polyethylene
POP	Polyolefin Plastomer
FFS	Form-Fill-Seal
CT PET	Chemically Treated Polyethylene terephthalate
ALU	Aluminium foil
BOPP	Bi-axially Oriented Polypropylene
LDPE	Low Density Polyethylene
EVA	Ethylene Vinyl Acetate
HDPE	High Density Polyethylene
PVC	Polyvinyl Chloride
PVDC	Polyvinylidene Chloride
BUR	Blow up ratio
MD	Machine Direction
TD	Transverse Direction
FFFS	Horizontal-Form-Fill-Seal
VFFS	Vertical-Form-Fill-Seal
PLA	Polylactic Acid
OPP	Oriented Polypropylene
COF	Coefficient of Friction

FDA	Food and Drug Administration
GSM	Grams per square meter
BAI	Backscattered amplitude integral
PPA	Polymer Processing Agent
DSC	Differential Scanning Calorimeter
RPM	Rounds per meter
ASTM	American Standard Test Method
TDS	Technical Data Sheet

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