

Abstract
Process Economics Program Report 10D
POLYURETHANES
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ABSTRACT

Polyurethanes are among the most widely used and versatile of all polymer forms, ranging from soft elastomers and foams to hard plastics. Since the global phase-out of CFC's required by the Montreal Protocol to reduce ozone depleting chemical emissions, a number of various alternative expansion agents are now being used by the polyurethane manufacturing industry to produce both cushion and insulation foam products. In addition, the U.S. EPA is attempting to regulate U.S. manufacturers by the amount of blowing agent used per foam grade.

The development and the diversification of many foam product foams and grades has been evolving since the 1950's by pioneering researchers to learn how to physically control the blowing chemistry to produce new products with different machine techniques. Over many years, this art has been advanced by many other scientists and engineers in multiple companies around the world. Since 1991 many new innovative formulation chemistries and manufacturing processes have been developed for polyurethane foam product manufacturing that either reduce or eliminate the use of ozone depleting blowing agents in the manufacture of flexible and rigid foams. This report reviews new technologies developed since our last report, with a focus on variable pressure polyurethane foam manufacturing processing to produce flexible foam products without the direct use of blowing agents. In addition, this report also reviews the use of alternative physical blowing agents for the manufacture of rigid laminated boardstock to be used as building construction insulation material. Two preliminary process economic evaluations are presented for flexible and rigid foam product production based on designs original to this report.

In addition this report presents a description of the fundamentals of foam formation, provides guidelines and technical options for selecting non-ozone depletion technologies, and reviews the current status and forecasts for production of polyurethane foams by major world region.

CONTENTS

1	INTRODUCTION	1-1
	FLEXIBLE FOAMS	1-1
	RIGID FOAMS	1-3
	REPORT FOCUS	1-3
2	SUMMARY	2-1
	MARKETS	2-1
	TECHNOLOGY	2-3
	Flexible Slabstock Foam	2-3
	Pentane Blown Rigid Construction Foam.....	2-5
	PROCESS ECONOMICS SUMMARY	2-6
	variable Pressure Foam	2-6
	Polyurethane Foam Boardstock Production.....	2-8
3	INDUSTRY STATUS.....	3-1
	INTRODUCTION	3-1
	ENVIRONMENTAL ISSUES	3-2
	FOAM CONSUMPTION	3-5
	Foam Price	3-6
	Foam Producers	3-7
4	TECHNOLOGY REVIEW.....	4-1
	FOAM FORMATION.....	4-1
	Raw Material Conditioning.....	4-1
	Mixing	4-2
	Foam Growth	4-3
	Cell Opening	4-5
	Curing	4-7

CONTENTS (Continued)

Formulation Developments.....	4-7
Cell Control and Size.....	4-8
Solubility / Viscosity.....	4-8
Diffusion Rate.....	4-9
Exotherm Control.....	4-9
Blowing Efficiency.....	4-9
GUIDANCE FOR SELECTING NON-ODS TECHNOLOGIES	4-9
Environmental Considerations	4-11
Global Issues.....	4-11
Ozone Depleting Potential.....	4-11
Global Warming Potential.....	4-11
Local Issues.....	4-11
Health and Safety	4-12
Toxicity and the Working Environment.....	4-12
Flammability.....	4-12
FLEXIBLE SLABSTOCK FOAMS	4-12
Technical Options for CFC Replacement.....	4-13
RIGID CONSTRUCTION FOAMS.....	4-14
Technical Options for CFC Replacement.....	4-16
REACTION INJECTION MOLDING	4-19
RIM Formulations	4-20
Isocyanates.....	4-21
Oligomers	4-22
Chain Extenders	4-23
Catalysts.....	4-23
Reinforced RIM.....	4-24
Filled RIM.....	4-24
Chopped Glass.....	4-24

CONTENTS (Continued)

Hammer Milled Glass	4-25
Flake Glass.....	4-25
Mica	4-25
5 VARIABLE PRESSURE FLEXIBLE FOAM MANUFACTURING.....	5-1
CHEMISTRY.....	5-1
Isocyanate Reactions	5-2
FLEXIBLE FOAM PROCESSES.....	5-3
Process Operations	5-3
Operating Pressure	5-4
Formulation Components	5-5
Process Description.....	5-5
SLABSTOCK PROCESS ECONOMICS	5-8
Capital Costs	5-9
Production Costs	5-9
Process Comparison	5-9
6 RIGID CONSTRUCTION FOAM MANUFACTURING.....	6-1
PROCESS CHEMISTRY.....	6-2
REVIEW OF PROCESSES.....	6-2
Formulation Development	6-4
Rigid Hydrocarbon Blown Foams.....	6-5
Rigid Hydrofluorocarbon Blown Foams.....	6-6
Potential Use of Renewable Raw Material Based Polyols.....	6-10
RIGID LAMINATED FOAM PRODUCTION	6-12
Formulation Components	6-13
PROCESS DESCRIPTION	6-14
PROCESS DISCUSSION.....	6-19

CONTENTS (Concluded)

COST ESTIMATES	6-20
Capital Costs	6-21
Production Costs	6-21
CONCLUSIONS	6-21
APPENDIX A: PATENT SUMMARY TABLES.....	A-1
APPENDIX B: DESIGN AND COST BASES	B-1
APPENDIX C: CITED REFERENCES.....	C-1
APPENDIX D: PATENT REFERENCES BY COMPANY.....	D-1

ILLUSTRATIONS

4.1	Changes in Ideal Gas Law Variables during Foaming.....	4-5
5.1	Pentane Blown Slabstock Production Schematic.....	5-4
6.1	Pentane Blown Boardstock Production Plot Plan and Schematic	6-16

TABLES

2.1	Forecast 5 Year Average Annual Growth, % (2001 - 2006).....	2-2
2.2	Process Economics Comparison Flexible Slabstock Production	2-7
2.3	Estimated Costs Rigid Pentane Blown Boardstock	2-8
3.1	U.S. EPA HCFC Use Restriction Schedule.....	3-3
3.2	Polyurethane Foams Balance by Region - 2001.....	3-5
3.3	Polyurethane Foam Consumption Growth, 2001 - 2006.....	3-6
3.4	Major U.S. Producers of Flexible Polyurethane Slab Foam January 2002 ^a	3-8
3.5	Major U.S. Producers of Molded Flexible and Semi-Flexible Foam 2002 Estimate.....	3-9
3.6	Major U.S. Producers of Rigid Polyurethane Foam Laminates and Boardstock 2002 Estimate.....	3-10
3.7	Major U.S. Suppliers of Polyurethane Foam Systems 2002 Estimate.....	3-11
3.8	Major Western European Producers of Polyurethane Foam 2002 Estimate.....	3-12
3.9	Major Japanese Producers of Polyurethane Foams 2002.....	3-16
4.1	Types of Polyurethane Blowing Agents by Foam	4-7
4.2	Properties of Alternative Blowing Agents	4-10
4.3	Technical Options for CFC Replacement in Slabstock Foams	4-14
4.4	Rigid Polyurethane Foam Products.....	4-14
4.5	Construction Foam Process	4-15
4.6	Relative Insulation Performance of Polyurethane Foams.....	4-16
4.7	Technical Options for CFC Replacement in Rigid Construction Foams	4-17
4.8	Practical Unit Operation Considerations for Filled RIM.....	4-26
5.1	Pentane Blown Slabstock Production Design Basis.....	5-7

TABLES (Concluded)

5.2	Pentane Blown Slabstock Production Total Capital Investment.....	5-11
5.3	Pentane Blown Slabstock Production Production Costs	5-12
5.4	Conventional Slabstock Production Production Cost.....	5-14
6.1	Euroclasses for Reaction to Fire	6-6
6.2	Pentane Blown Boardstock Production Design Basis.....	6-15
6.3	Pentane Blown Boardstock Production Formulation and Properties	6-17
6.4	Pentane Blown Boardstock Production Major Equipment	6-18
6.5	Pentane Blown Boardstock Production Total Capital Investment.....	6-22
6.6	Pentane Blown Boardstock Production Production Cost.....	6-23
A.1	CO ₂ Blown Slabstock Patent Summary.....	A-3
A.2	MDI Based Slabstock Patent Summary.....	A-6
A.3	TDI Based Slabstock Patent Summary.....	A-8
A.4	Pentane Blown Rigid Boardstock Patent Summary.....	A-13
A.5	HCFC Blown Rigid Boardstock Patent Summary.....	A-21