

# PU 104A: Polyurethane Adhesives & Sealants

## Market Overview

- i. Polyurethane Markets (Rigid, Flex Foam, and CASE)
- ii. CASE Market overview
- iii. Adhesive & Sealant market size and distribution based on chemistry and application type
- iv. Advantages/Disadvantages of different chemistries
  - o Contingent upon market data availability
- v. Market Trends (Growth Rates, Technology Drivers, Value Chains)

## Polyurethane Chemistry & Material Science

- i. Brief history of polyurethane technology
- ii. Polyurethane components and raw technologies
- iii. Pre-polymers: Preparation and usage
- iv. Overview of polyurethane materials science
- v. Polyurethane morphology & dynamics

## Brief Overview of Other Chemistries/Technologies

## Formulation Science

### 1-Component Systems

- i. Component selection and performance
- ii. Cure time, NCO content, and bubbling
- iii. Typical formulation additives

### 2-Component Systems

- i. Formulation criteria
- ii. Balancing mix ratio and viscosity
- iii. “One-shot” vs. prepolymer systems

## Structural Adhesives

- i. Definition of structural adhesives
- ii. Formulation considerations
- iii. Case study: Adhesives in Home Construction

## Flexible Adhesives

- i. Definition of flexible adhesives

- ii. Formulation considerations
- iii. Case study: Laminating/Packaging Adhesives

## Sealants

- i. Sealants vs. caulks
- ii. Sealant types: 1-component, 2-component, foaming sealants
- iii. Case study: Road and bridge expansion joint sealants

## Binders

- i. Introduction to PU binders
- ii. Polyurethane binders: 1-component and 2-component
- iii. Applications: Foam rebond, rubber crumb, wood, mineral, aggregate, etc.

## Adhesion Science & Test Methods

- i. Fundamental theories of adhesion
- ii. Surface science, surface preparation, and failure modes
- iii. Common mechanical test methods: shear, peel, pull-off, dynamic analysis
- iv. Common durability test methods: UV, temperature, moisture exposure
- v. Hands-on demonstration

## Wrap-Up/Summary/Final Questions