

## PU 104A: Polyurethane Adhesives & Sealants

### Market Overview

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

Break – 15 minutes

### Polyurethane Chemistry & Material Science

- Brief history of polyurethane technology
- Polyurethane components and raw technologies
- Pre-polymers: Preparation and usage
- Overview of polyurethane materials science
- Polyurethane morphology & dynamics

### Brief Overview of Other Chemistries/Technologies

Break – 15 minutes

### Formulation Science

#### 1-Component Systems

- Component selection and performance
- Cure time, NCO content, and bubbling
- Typical formulation additives

#### 2-Component Systems

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

### Structural Adhesives

- Definition of structural adhesives
- Formulation considerations
- Case study: Adhesives in Home Construction

### Flexible Adhesives

- Definition of flexible adhesives
- Formulation considerations
- Case study: Laminating/Packaging Adhesives

Lunch – 1 hour

#### Sealants

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

Break – 15 minutes

#### Binders

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

#### Adhesion Science & Test Methods

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

Wrap-Up/Summary/Final Questions