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COURSES FOR COPERION CUSTOMERS ON DESIGN AND OPERATION OF ZSK TWIN-SCREW EXTRUDER SYSTEM INTENSIVE PROGRAMS INCLUDE HANDS-ON TRAINING

At Coperion, we strive to be responsive to the needs of our customers. To make sure users of ZSK twin-screw extruders thoroughly understand the technology and are kept abreast of the latest technical advances, Coperion has developed in-house courses specifically for the ZSK Twin-Screw Extruder System. The objective of these courses is to provide process engineers, operations supervisors and operators with an understanding of the fundamental and practical aspects of the design and operation of the ZSK.

ZSK 101, now in its 36th year, continues to be our most popular class with many new attendees registering based on co-worker feedback. ZSK 101 is a 2.5 day course which takes an in-depth look at twin screw extrusion process design. It includes sections on process unit operations (feeding, melting, mixing, etc.) scale-up, compounding, troubleshooting and materials of construction. A full course outline is shown attached.

ZSK 102, in response to requests for hands-on training, Coperion expanded its classes to include ZSK 102. This 1 day course provides classroom instruction on the basic ZSK building blocks, barrels and screw bushings. Additionally, participants will spend a significant portion of each day in the lab learning how to efficiently assemble and disassemble machine components as well as basic operation of the ZSK. ZSK 102 is designed for operators, technicians and anyone responsible for the safe, efficient running of a ZSK extruder.

Session registration is limited to approximately 15 people - to assure that individual participant needs can be accommodated. Multiple company participation is probable. However, single company, or even single company location sessions can be organized.

The registration fee for the 2.5 day ZSK 101 course is $1250 per person, and $850 per person for the 1 day ZSK 102. Discounts are given for multiple registrations from an individual company. The fee includes notebook, program material, break refreshments and lunches. Lodging and other meals are not included.

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ZSK 101

The **2026** schedule is shown below:

ZSK 101	Start Date	End Date
Session 1	3/17/2026	3/19/2026
Session 2	6/9/2026	6/11/2026
Session 3	9/15/2026	9/17/2026
Session 4	12/8/2026	12/10/2026

ZSK 102	Start Date	End Date
Session 1	3/19/2026	3/20/2026
Session 2	6/11/2026	6/12/2026
Session 3	12/10/2026	12/11/2026

ZSK 101 & 102 Schedule	*ZSK 101 Day 1*	*ZSK 101 Day 2*	*ZSK 101 Day 3*	*ZSK 102 Day 1*	*ZSK 102 Day 2*
	8:15 a.m. – 5:00 p.m.	*8:30 a.m. – 5:00 p.m.*	*8:30 a.m. – 12:00 p.m.*	*1:00 p.m. – 5:00 p.m.*	*8:30 a.m. – 12:00 p.m.*

All classes listed above are hosted in our new lab and training facility in Pitman, NJ.

In addition to the regularly scheduled classes listed above, ZSK 101 can be conducted at your facility. The basic cost for the on-site ZSK 101 is $10,750 for up to 10 attendees. Additional attendees will be charged at a per person rate depending on the total number of attendees. These courses can be modified to fit your needs. Under those circumstances we will be happy to discuss your needs and provide you with a customized pricing schedule.

The above pricing for on-site classes does not include travel expenses for two instructors, which are billed at cost.

For additional information on either the regularly scheduled classes or the on-site program, or to register for a course, please contact:

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ZSK 101 COURSE OUTLINE

ZSK TWIN SCREW EXTRUSION COMPOUNDING SYSTEM

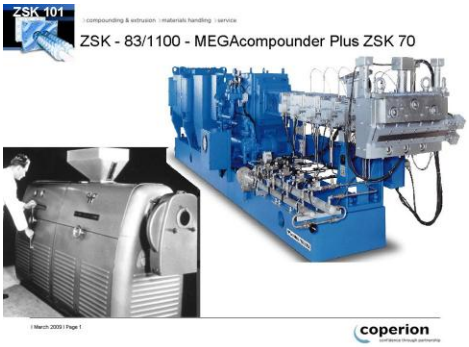
DAY 1:

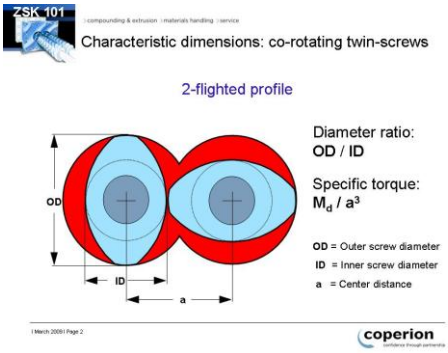
I. INTRODUCTION

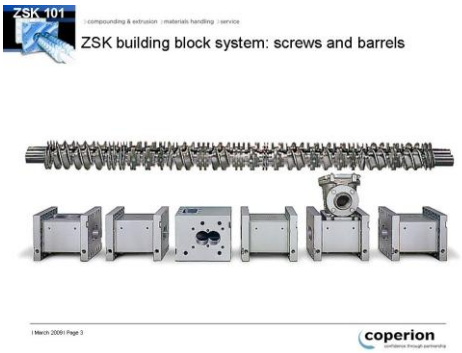
II. ZSK DESIGN CHARACTERISTICS
- A. Historical Background
  - 1. Applications of Twin Screw
  - 2. Different ZSK Generations
- B. Definitions
  - 1. Outer & Inner Diameter
  - 2. Torque
  - 3. Shear Rates
  - 4. Free Volume
- C. Basic Machine Components
  - 1. Screw Bushings
  - 2. Kneading Blocks
  - 3. Special Elements
    - a. SK/SF
    - b. Distributive Mixing Elements
    - c. 3-lobe KB
  - 4. Barrels
  - 5. Vents
- D. Pelletizer Options

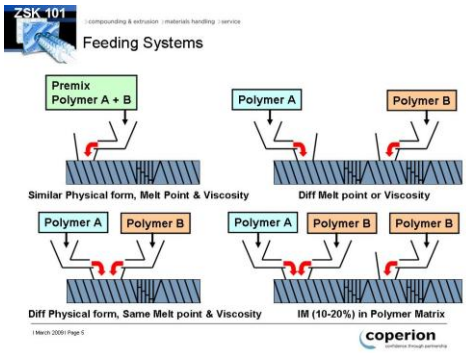
III. FEEDERS AND FEED HANDLING SYSTEMS

IV. UNIT OPERATIONS Part 1
- A. Feed Handling/Preparation
- B. Feeding
  - 1. Upstream Feeding
  - 2. Downstream Feeding
    - a. Solids
    - b. Liquids
- C. Plastification
  - 1. Conductive/Convective
  - 2. Shear Dissipation









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ZSK 101 COURSE OUTLINE

DAY 2:

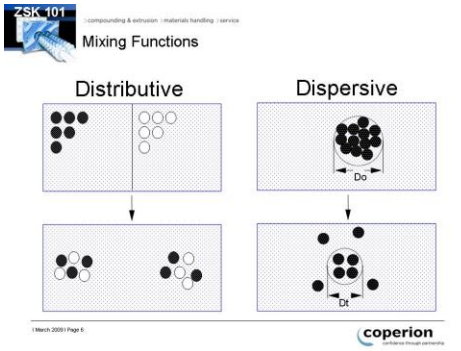
V. UNIT OPERATIONS Part 2
- D. Mixing
- E. Devolatilization/Degassing
- F. Metering/Pressure Generation
- G. Discharge
  1. Pelletizing Train
  2. Direct Extrusion

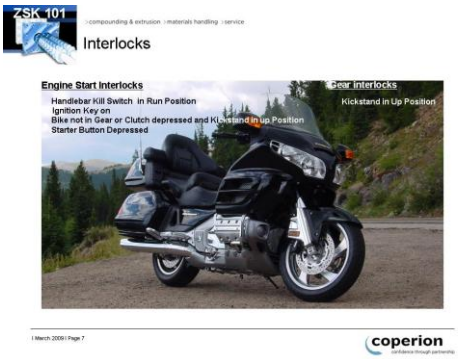
VI. PROCESS CONTROLS & INTERLOCKS
- A. System Scope
- B. Design
- C. Safety Interlock System

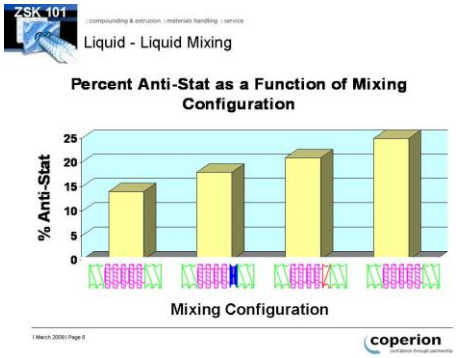
VII. EXAMPLES OF PROCESS SYSTEMS
- A. Compounding
  1. Dispersive
  2. Distributive
- B. Devolatilization

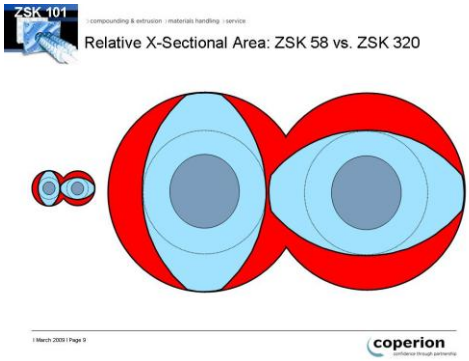
VIII. SCALE-UP FACTORS FOR ZSK MACHINES
- A. Machine Series Geometry Difference
- B. Basis for Scale-up Method Selection
- C. Volumetric Scale-up - Degree of Fill
- D. Alternate Method to Scale Throughput: Specific Mechanical Energy
- E. Scaling Shear Rate for ZSK Extruders
- F. Scale-up for Heat Transfer

IX. LABORATORY, ASSEMBLY & OPERATION









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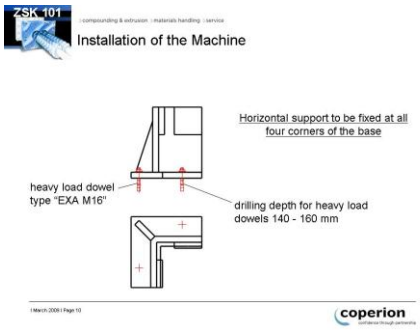

DAY 3:

X. TROUBLE SHOOTING THE PROCESS

XI. MAINTENANCE OVERVIEW
- A. Maintenance Manuals
- B. Spare Parts

XII. EXTRUDER WEAR/MATERIAL OF CONSTRUCTION
- A. Types of Wear
- B. Wear Reduction/Process Related Minimization
- C. Wear Reduction/Special Materials of Construction

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