Overview
This course covers the various thermoplastic materials used in thermoforming and their properties, the various thermoforming procedures, as well as how to detect and eliminate faults. The know-how gained is put to practice: Different procedures and different materials are tried out. The question is: how can different plastics be pulled into the same mold? The systematic investigation of faults will be covered on two machines. Thermoforming is a manufacturing process which requires a lot of knowledge about materials and machines. This course teaches the participants the know-how and the craftsmanship necessary to produce high-quality parts.

Contents
- Theory:
  - Material science
  - Thermoplastic materials for thermoforming
  - Production of thermoplastic semi-finished products
  - Construction of machine
  - Trials with various materials and procedures
  - Properties of deep-draw thermoplastic materials
  - Basics and terms in thermoforming
  - Information on molds
  - Thermoforming procedure and special procedures
  - Procedure during thermoforming
  - Faults during thermoforming

Contact
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Who will benefit?
Machine operators, fitters

Equipment
1 Thermoforming machine
1 Mold
2 different Materials max. 3 mm wall thickness
max. 12 participants

Practical training:
- Preparation: material, mold and machine
- Variation of parameters and its influence on the quality of the part
- Testing of different materials on their suitability for each part
- Potential faults

Summary
Examination

Who will benefit?
Employees of blow molding operations

Equipment
1 Machine
1 Mold
max. 10 participants

Practical Training:
- Getting familiar with the extrusion blow molding line
  - Starting, optimizing
  - Changing the mold
  - Conserving the mold
  - Starting and optimizing the molded part
  - Manufacturing report

Examination

Injection Molding
Extrusion
Blow Molding
Thermoforming

Training for Professionals
Plastics Processing Technologies
Overview
Modern, complex injection molding machines and the corresponding tools require sound knowledge. Companies should make sure that their employees receive the best possible qualifications for the setting of injection molding machines.

Practical experience and essential information on technology and material science improves the understanding of work on machines which ultimately enhances safety. Our experience has shown that this also prolongs the lifespan of expensive machines and molds. And: Excellent workers give your company an edge on competition.

Who will benefit?
Employees of injection molding companies interested in receiving sound knowledge in setting of injection molding machines and those who want to consolidate their knowledge.

Equipment
1 Injection Molding machine
1-2 Molds with variable parameter settings
max. 15 participants

Contents

Material science
- Preparation, drying
- Process guidelines for the most common injection molding materials / compounds

Principles of Injection Molding technology
- Machines, processes, tools, special procedures

Injection Molding Technology
- Influence of the machine and process parameters on the quality of the injection molded part
- Influences on shrinkage
- Cavity pressure measurement

Mold construction
- Types of gating, rheology, venting, alignment, types of molds, maintenance of injection molds, temperature control

Practical training:

Preparation for mold setting and mold changing
- Installation of the injection mold and equipping the clamping unit
- Calculation of the necessary clamping pressure
- Adjustment of the mold locking

Setting the injection unit
- Determining the filling point (volumetric mold filling without holding pressure)
- Varying of the injection speed
- Determining the necessary injection pressure

Determining the filling point
- Cavity pressure curves for optimization of machine parameters
- Process monitoring and documentation using measurement the cavity pressure measurements
- Optimization of molded part using holding pressure programs

Trouble shooting (in small groups)
- Starting and optimizing injection machines, practice and application of knowledge gained during course

Examination
Overview
Injection molding is a skill. Systematic faults waste company’s time and money. The faultless interaction of machine, mold, material and worker is a prerequisite for the production of the perfect part. This makes the quick, systematic fault location and elimination even more important. This two-day course will teach the participants the physical and rheological relationships involved in the process of constructing a part. The practical training on the variation of operating parameters on injection molding machines will help to eliminate and avoid faults due to “human error”.

Who will benefit?
Technicians and specialists involved in design, production, quality control, purchase and technical sales.

Equipment
1 Injection Molding machine
2 Molds with problematic surfaces
1 Mold with warpage

max. 15 participants

Contents
✴ Theory:

Possible fault causes – The 4-M-Method
a) Cause: Machine Setting
   • Temperatures
   • Pressures
   • Speeds
   • Paths, time, etc.

b) Cause: Mold
   • Runner
   • Wall thicknesses
   • Injection points
   • Mold cooling, etc.

c) Cause: Plastic Material
   • Molar mass distribution
   • Additive, filling and reinforcement materials

d) Cause: Machine
   • Wear of the injection molding machine
   • Defects in peripheral equipment

✴ Practical training:

Practice on the injection molding machine
• Faults detection using sample parts
• Identifying a cause
• Systematic optimization of machine settings to eliminate determined faults
• Adjustment of injection program and holding pressure program to the injection molded part

Shrinkage and Warpage
• Influencing factors
• P-v-T behaviour of plastics
• Causes of warpage
• Possible counter-measures

Testing strategy
• Possible experimental methods

Practice on the injection molding machine
• Optimization of shrinkage
• Optimization of warpage

Subject to alterations · For more details visit www.skz.de
Overview
An extrusion line is a technically complicated machine, a costly investment. That is why extrusion operations must have a genuine interest in qualified employees, experienced in setting and starting extrusion lines and can optimize the extrusion process. This course offers theoretical knowledge necessary in the areas of material science, process technology, quality assurance and techniques for testing. It makes sure that the participants gain or consolidate all the necessary knowledge of the functional processes in extrusion through practical training.

Who will benefit?
Employees in extrusion operations

Equipment
1 Machine
1 Die

max. 12 participants

Contents
► Theory:

Material science
• Chemical structure
• Classification
• Application areas

Important plastics for extrusion
• PE, PP, PVC, PA, PC, PET

Basics of the machine
• Construction of machine
• Screw design

The basics of shape and stabilization there of
• Tool
• Calibration of tool
• Cooling of pipe, profile and board

Basics of process technology
• Melting model
• Melt flow
• Follow-up fittings
• Special processes

Overview of testing procedures for raw materials
• Gross density
• Powder density
• Free-flowing property
• MFR/MVR
• Viscosity/K-value

► Practical training:

Getting familiar with the extrusion line
• Starting, optimizing
• Determination of process parameters through volume, material thickness
• Determination of weight per meter by means of data sheets
• Optimization of process parameters: speed, pressure and temperature
• Measuring
• Elimination of defects: material to warm or to cold
• Operate with double seed by constant weight per meter

Examination
Overview
This five-day course teaches the participants the necessary know-how for the setting of blow molding machines and consolidates know-how. The theory part covers the plastics relevant to blow molding as well as the basics of the machines and the process. The know-how gained is then used on the extrusion blow line in the practical training part. The program includes starting and optimizing the blow molding process as well as the influence of processing parameters on the properties of the molded part. The overview of the test procedures for raw materials and molded parts ends with an examination.

Who will benefit?
Employees of blow molding operations

Equipment
1 Machine
1 Mold

max. 10 participants

Practical Training:
Getting familiar with the extrusion blow molding line
- Starting, optimizing

Changing the mold
- Conserving the mold
- Starting and optimizing the molded part
- Manufacturing report

Examination

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Examination

Material science
- Chemical structure
- Classification
- Application areas

Important plastics for blow molding
- PE, PP, PVC, PA, PC, PET

Basics of the machine
- Construction of the machine
- Construction of the screw
- Head molds
- Regulating wall thickness
- Locking units
- Blow molding molds

Basics of procedure
- Cycle, finishing

Special procedures
- Co-extrusion
- 3 D-blow molding
- Suction blow molding
- Injection blow molding

Overview of test procedures for raw materials
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- Powder density
- Free-flowing property
- MFR/MVR
- Viscosity/K-value
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