Plastics Process Technician Apprenticeship Program

Curriculum and Description

Health and Safety/Teambuilding (5 Days)

- OSHA 30: Introduction to OSHA, Managing Safety and Health, Walking and Working Surfaces, including fall protection, Exit Routes, Emergency Action Plans, Fire Prevention Plans, and Fire Protection, Electrical, Personal Protective Equipment (PPE), Materials Handling, Hazard Communication, Hazardous Materials, Permit-Required Confined Spaces, Lockout/Tagout, Machine Guarding, Welding, Cutting, and Brazing, Introduction to Industrial Hygiene, Bloodborne Pathogens, Ergonomics, Fall Protection, Safety and Health Programs, Powered Industrial Vehicles
- Myers Briggs Type Indicator (MBTI): In this interactive workshop, participants will gain an understanding of the Myers Briggs Type Indicator (MBTI). The MBTI Assessment was developed to make the theory of psychological type understandable and useful in people's lives. When you understand your personality type preferences, you can approach your own work in a manner that best suits your style, including: how you manage your time, problem solving, best approaches for decision making, and dealing with stress. Knowledge of type can help you better understand the culture of the place you work, develop new skills, understand your participation in teams, and cope with change in the workplace.

Plastic Materials (2.5 days + online reviews + exam)

- This course is designed to give students a solid foundation for understanding polymer families, their corresponding material properties, plastic rheology, and shrink and warp characteristics. The course begins with a discussion on creating polymers from monomers, followed by the importance of molecular weight to your part’s performance and processing characteristics. The course then dives into material drying requirements and measurement, additives, viscosity, and rheology (study of plastic flow). Students will learn what makes some polymers amorphous and others semi-crystalline, and how those classifications affect material properties, processing, mold design, and part design. Finally, the course will teach students to understand and recognize volumetric vs. orientation-induced shrinkage, and how each causes plastic parts to warp. They will then learn strategies for reducing warp by evaluating options in material selection, mold design, processing, and part design.
- Topics include: Polymerization methods; Tg and Tm; differences between amorphous and semi-crystalline materials; molecular weight; drying; crystallinity and its effect on material properties; plastic flow characteristics; viscosity; plastic shrink and warp.

Mold Design (2.5 days + online reviews + exam)

- The Mold Design course is designed to help students gain a working knowledge of mold design and manufacturing processes. The course starts off by identifying the five key systems of a mold: melt delivery, cooling, structural, venting, and ejection. We will discuss the foundations of each system and how they all affect the formation of the plastic part and the final part quality. Students will also learn how to evaluate a mold design based on the 5 systems and recognize design features that could be improved. They will also learn troubleshooting strategies and the right questions to ask during a mold review process. Students learn to identify common mold components, both on industry molds and on mold prints, through the lecture and labs, including two mold tear down and assembly lab sessions, a session on mold print reading, and a cooling cart demonstration.
- Topics include: Labs on mold tear down and assembly, reading mold prints, and cooling; 2-Plate and 3-plate mold bases; in-mold pressure drop; series versus parallel mold cooling designs; strategies for optimizing mold cooling; turbulent flow; baffles and bubblers; structural considerations in plate deflection; core/cavity alignment and pocketing techniques; ejection strategies for forming undercuts; types of hot and cold runner systems; runner sizing strategies; gate design and location strategies; venting details and strategies.

Maintenance (5 days)

- AC/DC Fundamentals: This course covers the fundamentals of AC/DC theory and laboratory practice (if possible) by applying electrical theories to circuits and instrumentation. Theory will be related to reading technical schematic drawings and application to machines, assemblies and electrical applications. Topics include: Orientation/Safety, Ohm's Law, Resistors, Series and parallel circuits, DC circuits, AC circuits, Kirchoff's Law, Thevenins and Norton's Theorems, Resistance, Inductance, Capacitors, Transformers, Filters, Power factor correction
- Fluid Power: This course applies the principles and applications of hydraulics and pneumatics as they apply to power and control of industrial equipment. Topic include: Safety, Hydraulic and pneumatic principles, Basic pneumatic circuits, Hydraulic/pneumatic power systems, Principles of pressure and flow, Hydraulic/pneumatic speed control, Hydraulic/pneumatic DCV applications, Pressure control circuits.

Molding 1 (4 days + online reviews + exam (written and on-machine))

- This course focuses on starting up a mold using an existing documented process and utilizes a 50% split of machine time versus classroom time. This is an introductory course on injection molding while covering fundamental shop floor and machine safety topics. Students will learn about different types of machine designs and controls, including hydraulic and electric injection molding machines, and both toggle and hydraulic clamping systems. The course will also expose students to thermolators, grinders, dryers, and other auxiliary equipment. Students will learn how to interpret material data sheets and typical process documentation sheets. The course also teaches methods for correctly restarting a molding process and recognizing common molding issues including short shorts, flash, and moisture problems. Students will utilize AIM's Mold Start-up Checklist as the foundation for the processing sections of this course.

- Topics include: Labs on safety and procedures, machine introduction, machine preparation, material preparation, mold preparation, process startup & verification, and process troubleshooting; startup checklist & process documentation; molding process overview; review of plastic materials; material preparation for molding; review of mold designs; and process startup & verification strategies

Quality Systems (5 days)

- This training covers principles of quality management and professional communications utilizing problem solving activities related to industrial situations. Focuses on the development of managerial applications in dealing with individuals, groups, and organizations. Topics include: Critical thinking, problem solving, leadership, listening and communication, conflict resolution, motivation and work groups.

Molding 2 (8 days + online reviews + exam (written and on-machine))

- The Molding 2 course builds on the skills and machine familiarity learned in Molding 1 by now focusing the students on strategies used for developing and documenting a scientific molding process by utilizing a 50% split of machine time versus classroom time. Students will learn on three different molding machines while understanding the different controllers and the information needed to get the molding machine functional with all variables zeroed out prior to each lab. The course goes deeper into each subject matter as compared to Molding 1, including plastic materials and mold design strategies that directly affect the performance of the mold and the resulting process window. This course focuses on separating out plastic variables (plastic flow rate, pressure gradient, cooling rate and time, and melt temperature) versus machine variables and the importance of each. Students will utilize AIM's Process Development Strategies and Workbook as the foundation for the processing sections of this course.
- Topics include: Labs on molding machine setup, machine specifications, drying and moisture testing, machine zero to fill-only parts, fill time scan, machine zero to full parts, process development part 1 and part 2, troubleshooting with flow grouping methods, and open lab time; molding process overview; ; material preparation; plastic temperature; plastic flow rate; plastic pressure gradient; plastic cooling rate and time; pressure loss study; part design; introduction to machine and cavity pressure curves; additional topics related to plastic materials; material preparation for molding; additional topics related to mold designs; and process startup & verification strategies