

Module 300 – Lesson Two: METALFORMING THEORY

Lesson Description:

Students will learn to identify the basic machinery components, modes of operation and tooling. The basic function of each component will be addressed. The lesson includes terminology and basic theory relating to the movement of the ram and operation of the machinery. Identification and function of metal fabrication equipment. Knowing the components of a pierced opening aids in measuring a pierced feature correctly. Students learn the components, order and function of a basic feed line. *Prerequisite:* Module 300 – Lesson One: *Basic Metallurgy*.

Learning Objectives:

At the completion of this lesson, the student will be able to:

- ◆ Identify (or label) the basic parts of a press and explain the function of selected components.
- ◆ Identify and distinguish various press modes of operation and tooling.
- ◆ Define terms relating to the movement (action) of the ram/cam travel or slide.
- ◆ Identify and state the purpose for the laser cutting machine, press brake, CNC turret press kick presses and/or small air presses.
- ◆ Define and locate the cut band, break and burr side on a blank (including a pierced opening) knowing that measurements are taken on the cut band.
- ◆ Identify two symptoms of a punch press or press brake that has been offloaded.

Methods of Instruction:

Lecture, videos, picture boards/pictorials, simulations and real-world examples.

Methods of Evaluation:

Individual presentations/reports and written quizzes/exams (*PROficiency Assessments*) during and after training.

Lesson Materials Provided by PMA:

- ◆ PMAEF Video – *Tooling, Dies & Material Feeds*
 - Die Components & Their Function*
 - Uncoiler, Straightener & Feed Components*
 - Basic Operations Performed on the Die*
 - Press Brake Tooling*
- ◆ Student Handouts and Exercises (including equipment/component drawings or pictures)
- ◆ *PMAEF Instructor's Guide, SMART Lesson Plan and PROficiency Practices & Assessment.*
- ◆ Overhead Transparencies
- ◆ PMAEF Item Banks (assessment questions) for construction of end of lesson examination.
- ◆ List of recommend student reading and study materials (books, brochures, articles, etc.)

☞ Note: Handouts, transparencies and item banks provided on CD or disk.

Lesson Topics & Content Outline:

- ◆ **Stamping, Slide Forming, Press Brake, Roll Forming, Turrets and Lasers**
- ◆ **Operations, Basic Machine Parts, Tooling and Function of Components**
 - Bed
 - Bolster Plate
 - Tooling and Die Assembly
 - Control Panel, Activation Devices and E-Stop(s)
 - Crankshaft, Flywheel and Main Motor
 - Cushion
 - Flywheel and Main Motor
 - Frame
 - Gibs
 - Pitman
 - Ram, Slide and Punch, etc.
- ◆ **Press Modes and Feed Mechanisms**
 - Hand Feeding
 - Set-up (Jog/Inch) Mode
 - Production (Continuous run) Mode.
- ◆ **Movement (action) of the Ram/Cam Travel**
 - Top Dead Center (TDC) and Bottom Dead Center (BDC)
 - Die Shut Height and Stop Block (bumper)
 - Press Shut Height
 - Punches (Cutting, Forming and Combination) and Piercing
 - Stamping Dies (Single, Compound, Progressive, Blanking, Transfer and Deep Draw)
 - Ram Adjustment
 - Revolution
 - Stroke/Hit.
- ◆ **Components of the Feed Line (Material Delivery Systems)**
 - Payoff Reel and Uncoiler(s)
 - Straightener
 - Feeding Mechanisms (includes Magazine Feeders, Sheet Fed, Wire, Coil Fed Systems)
 - Pass Line of the Feed and Die.
- ◆ **Shearing and Characteristics of Cut Edges**
 - Cut Band
 - Break and Brake Off Taper
 - Burr Side.
- ◆ **Other Equipment, Feed Mechanisms, Machine Processes & Tooling**
 - Press Brake
 - CNC Turret Press
 - Laser Cutting Machines (CNC)
 - Offloading
 - Kick Presses and Small Air Presses
- ❖ **Final Exam (PROficiency Assessment)**
 - ☞ Note: See individual *SMART* Lesson Plan contained in the Instructor's Guide for detailed instruction content, flow of lesson, and assessments. At this lesson, the instructor should check with local education institutions teaching Tool & Die to see if their students could make some dies and/or solicit materials donated by a local metalforming company/shop.