

## Course One – Introduction to Automated Materials Joining

### Essential Question:

What are the essential principles of joining technology and assembly line efficiency?

### Engagement Scenario:

Automated Manufacturing requires the manufacture of individual components by forming, machining, injection molding, coating, or welding, bonding or mechanical joining. It also requires the assembly of these parts into a final product. After learning about the assembly of a common object, such as an ink pen and how it is manufactured, you will be introduced to automated manufacturing processes through the use of a manufactured gate valve product.

A common means to assemble a small, portable product, such as the gate valve is an assembly line. The product moves sequentially from one assembler to the next, and the assemblers remain stationary. In the assembly line approach, the concept of division of labor is used as every assembler becomes an expert at his or her particular sub-assembly operation. Since not all assembly operations require exactly the same amount of time, sequential assembly lines tend to develop bottlenecks, which are activities that take longer than any of the other operations. Identifying and eliminating bottlenecks in the operation in an assembly line is a common problem.

The American Valve Company (AVC) and the Classic Valve Company (CVC) compete with each other to manufacture three versions of a standard shut off valve. They each are seeking to build an assembly line with work cells in which some are designed to use human assembly and some are being converted to use robotic work cell assembly. As you learned while working with the assembly of an ink pen, the manufacturing process requires exact timing of when parts are put together and joined. The manufacturing companies have been having issues with bottleneck operations and timing of work cells flow.

An executive from one of the companies is involved in your school and serves on your teacher's advisory council. During a recent meeting, your teacher shared how important it is for you to get an overview and an introduction to automated materials joining technology in this course. Your teacher approached manufacturing supervisors from each of the companies and they offered to allow your class to help them solve their timing issue.

Your teacher agreed and has shared that you and half your class will work on one team representing AVC and the other half will work on a different team representing CVC. You will experience the bottleneck operation during the assembly of the valves at different stages and determine how to improve or identify the proper timing between the work cells. You will gather data of the timing issues using an initial approach, calculate and determine costs of each work cell, identify modifications necessary to cut time and reduce costs, test those, discuss, and make a recommendation addressing the following questions:

1. What method is the most effective for the assembly of the valves? Why?
2. What were the most and the least profitable assembly runs?
3. What are the changes your team will recommend to "optimize" the system?
4. What are the duties, responsibilities, and educational requirements for a career as a manufacturing supervisor? (Note: Throughout the course, during each project you will explore various careers and future opportunities related to the experience through a **Career**

**Connection** that will help you understand how a particular career is connected to the field of materials joining technology.)