

- 14.11. Draw a process flow diagram for your activities from the time you wake up until you arrive at work. Can you think of ways to improve the process?
- 14.12. A process can produce a final product at the rate of 2 products per minute. If an individual product takes 30 minutes to pass through the process, what is the inventory of products in the process at any time?
- 14.13. A university registration process can register a person every 4 minutes. If there are an average of 12 people in line for the registration, how long will each person have to wait in line?

## CASE STUDY 14.1

### Cheryl Franklin, Production Manager

Cheryl Franklin had been production manager at Cooper Toy Company for only a week when she started to wonder if her promotion had really been a good thing. Her boss was concerned that production was falling behind on one of their newest toys. The company had spent a lot to advertise the toy and the demand that had been created was not being met by production.

Cheryl decided to try to investigate to discover the problem and try to get the production volume back on track. Unfortunately, she found that almost everyone involved was blaming someone else.

The toy in question was one of those plastic water guns popular at beaches and swimming pools. Water is held in a reservoir and then air is pumped into the gun, allowing a fairly large stream of water to be shot about 10 meters.

Cheryl knew that the slowest part of the production line that she was using to produce the toy should be able to produce one every 3 minutes, and she also knew that the demand averaged only about one toy every 5 minutes. When she started her investigation at the assembly area, however, she found that assembly was averaging only one toy every 10 minutes. The assembly supervisor had a good explanation, however. He said that they didn't have enough inventory to work on. They were getting the water tanks being released from inspection on average only one every 8 minutes, so they were assembling the toys as fast as they could.

When Cheryl went to the inspection area, she discovered that there were lots of tanks waiting there to be inspected. The inspector assigned to the tanks appeared to be working hard, but obviously that was the problem.

Cheryl talked to the quality manager and got quite a bit more information. To quote the quality manager, "Look, we need to put those tanks through some important testing. If a child pumps too much air into the tank they are designed to let some of the air out through a relief valve. Unfortunately, a lot of the tanks have improperly glued seams. If one of those bad tanks gets on a toy then the tank is liable to rupture before the relief valve activates. That rupture could send pieces of plastic flying. The last thing we need is to have some child get injured with flying plastic. We find that we have to inspect every tank since the reject rate on the gluing of the seams has been running close to 20 percent!"

Cheryl continued her investigation and discovered the following:

- The supervisor of the production area where the glue was applied claims the machine used to spread the glue will often clog, and even when it works, the glue will often be applied unevenly.
- The maintenance people in charge of the glue machine claim the machine doesn't work well because the glue fixture is not correct for the application and the glue itself is too thick for the type of application.
- The engineers in charge of the design and installation of the glue fixture claim that the toy was rushed into production so quickly that they did not have time to design a proper fixture so they were forced to use an old one that was originally designed for a different application.