Chapter 3

# Understanding the Supply Process: Evaluating Process Capacity

In the attempt to match supply with demand, an important measure is the maximum amount that a process can produce in a given unit of time, a measure referred to as the *process capacity.* To determine the process capacity of an operation, we need to analyze the operation in much greater detail compared to the previous chapter. Specifically, we need to understand the various activities involved in the operation and how these activities contribute toward fulfilling the overall demand.

In this chapter, you will learn how to perform a process analysis. Unlike Chapter 2, where we felt it was sufficient to treat the details of the operation as a black box and merely focus on the performance measures inventory, flow time, and flow rate, we now will focus on the underlying process in great detail.

Despite this increase in detail, this chapter (and this book) is not taking the perspective of an engineer. In fact, in this chapter, you will learn how to take a fairly technical and complex operation and simplify it to a level suitable for managerial analysis. This includes preparing a process flow diagram, finding the capacity and the bottleneck of the process, computing the utilization of various process steps, and computing a couple of other performance measures.

We will illustrate this new material with the Circored plant, a joint venture between the German engineering company Lurgi AG and the U.S. iron ore producer Cleveland Cliffs. The Circored plant converts iron ore (in the form of iron ore fines) into direct reduced iron (DRI) briquettes. Iron ore fines are shipped to the plant from mines in South America; the briquettes the process produces are shipped to various steel mills in the United States.

The example of the Circored process is particularly useful for our purposes in this chapter. The underlying process is complex and in many ways a masterpiece of process engineering (see Terwiesch and Loch [2002] for further details). At first sight, the process is so complex that it seems impossible to understand the underlying process behavior without a