

SENS LEAN PRODUCTION SYSTEM DELIVERS

SENS is a lean manufacturer. We deliver what at first seems like a paradox: *finest quality* products, built to order and *shipped faster* than competitors can ship from stock, *at competitive prices*.

“Lean” systematically eliminates waste from the production process to deliver goods and services that customers value, when customers expect them and without defect. Simple in concept, lean takes total organizational commitment and intense work to implement properly.

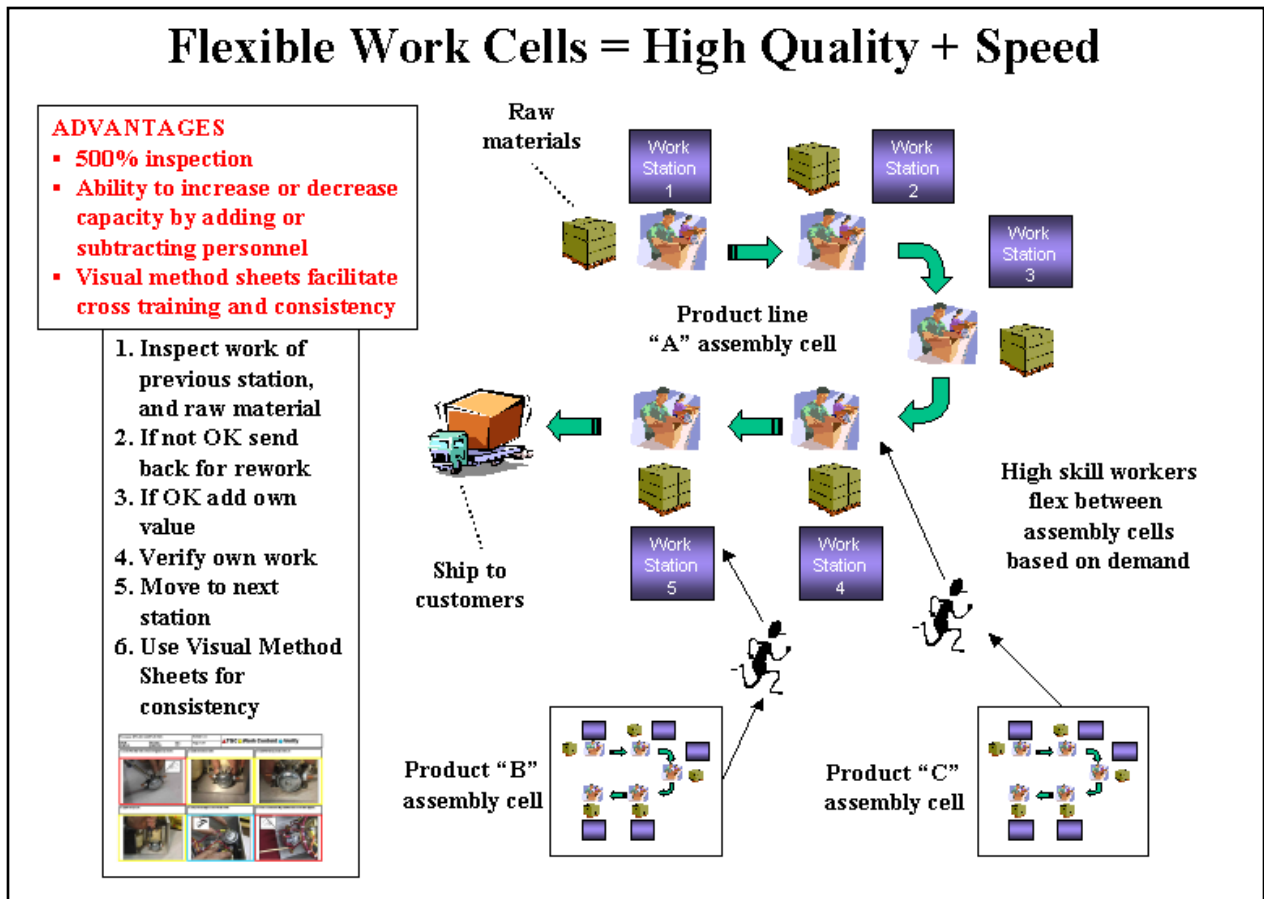
The first step in our overview is an explanation of how SENS organizes the assembly process into workcells. (See Figure 1)

Reducing waste and time

Instead of trying to inspect in quality at the end of the line, SENS builds quality into the product during manufacturing by making many quality checks during assembly. This fosters high-performing work teams for maximum productivity and employee involvement.

SENS’ workcell arrangement is a vast improvement over the obsolete “batch-build” schemes still in widespread use. In a batch environment, a number of products are built simultaneously and not inspected until the end of the manufacturing process. This causes expensive and time consuming problems. When defects are found, the entire batch must be reworked, wasting time and material.

FIGURE 1



SENS, in contrast, builds chargers using single-piece flow. Inspection takes place at each succeeding step (typically five times) in the build process for problems with raw materials, workmanship or even the product's design. Quality problems are pushed back to the previous station in the cell, or back to suppliers for rework. When more serious problems occur the cell is shut down until a quick response team discovers the origin of the problem and its solution. This prevents production of faulty equipment.

Workcells greatly increase factory capacity

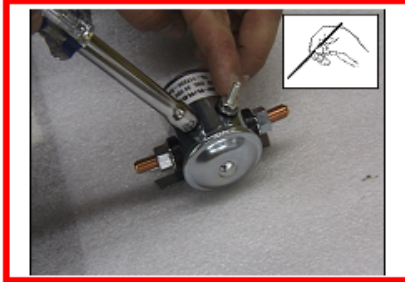
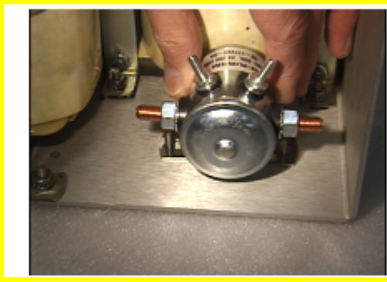
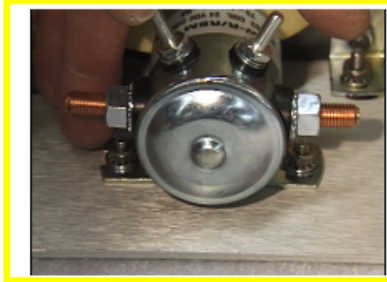
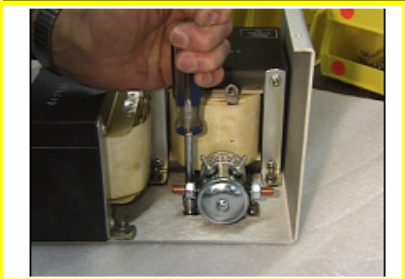
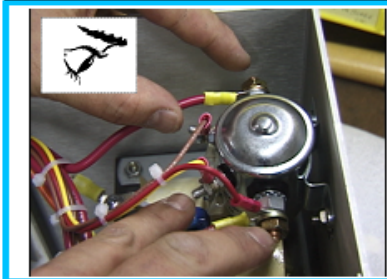
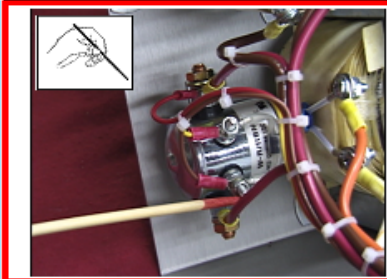
Factory capacity can be constrained by many things, including lack of space, lack of labor, insufficient information and lack of materials. Here is how workcells increase factory capacity:

Space consumed by a SENS workcell is less than half required in a traditional environment. Fast build and close supplier integration means no need for finished goods and minimum work in process or warehouse space.

Nearly 80% of SENS highly qualified assembly labor force can flex between workcells building different types of chargers or power systems. This allows a small pool of highly skilled personnel to meet nearly any surge in demand on all product lines.

SENS employs Visual Method Sheets (VMS) to assure inspection and assembly consistency (see Figure 2.) Each workstation in the cell has visual sheets depicting the step-by-step way to build each product. VMS drastically reduce training time and quality defects related to hiring new assembly personnel.

FIGURE 2 – SAMPLE VISUAL METHOD SHEET

Process: BPS-63 SAMPLE VMS		Kanban: xx		▲ TQC ■ Work Content ● Verify
VM #: SAMPLE	Eff. Date: 4 MAR 98	Rev: 1.0	Page 1 of 1	
1. Check #10 studs from sole board for tightness as shown	2. Install sole board as shown	3. Install #10-32 hex nuts as shown 2X		
				
4. Tighten to spec 2X	5. Verify nuts are tight on sole board as shown		6. Check sole board mounting hardware and connections tight 6X	
				

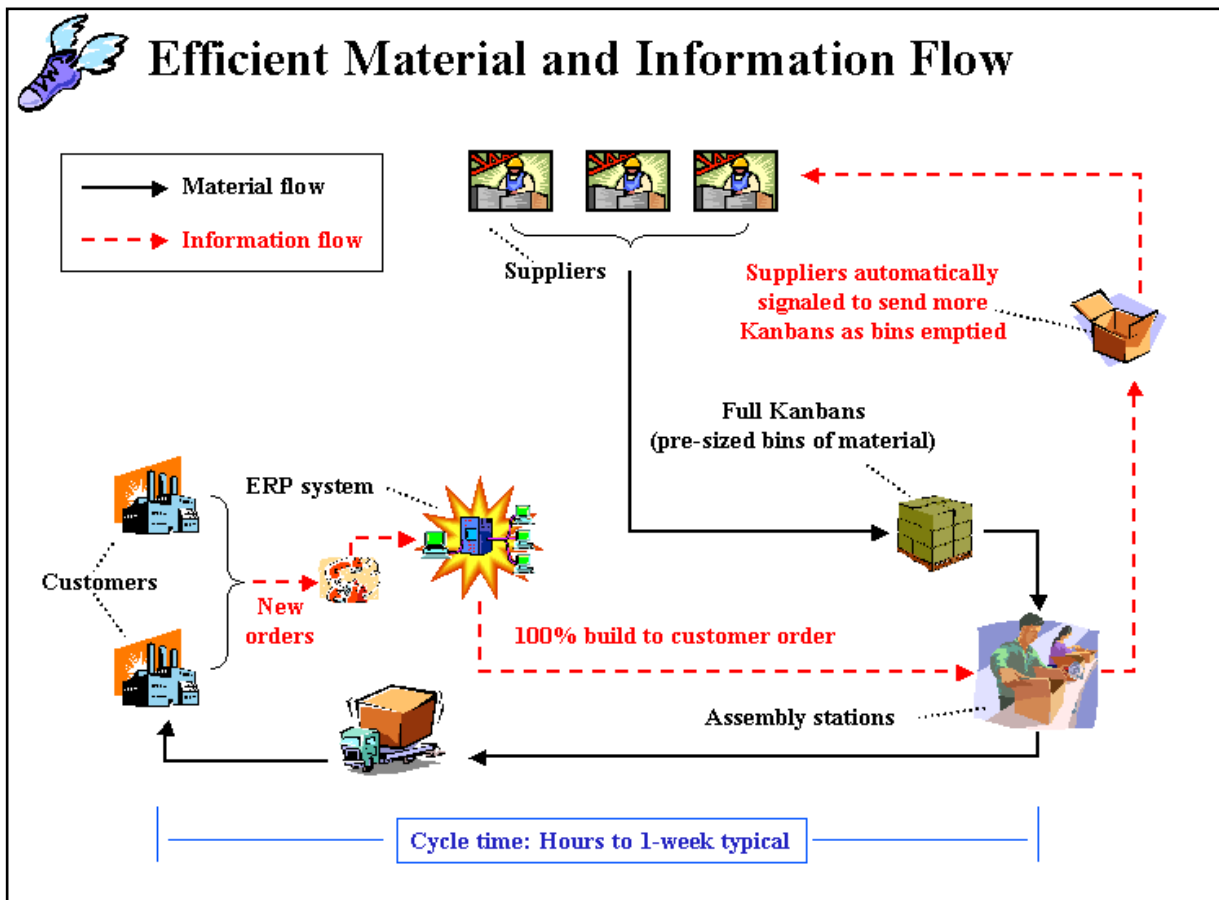
Organizing into workcells with clear documentation and highly trained personnel is a powerful boost to factory capacity – at low cost. For example, SENS produces nearly 20,000 chargers per year. On average, two to three people, who share the jobs of all five stations, typically populate each product’s five-station workcell. During a surge in demand, however, five people man the cell – increasing output up to 200% or more of the average requirement. After the surge is over the cell is depopulated, when personnel move to a different cell to handle the surge in volume there. If a surge in volume is sustained beyond what five people can achieve, SENS either overhauls the assembly process to reduce more waste, or duplicates the assembly cell. This typically takes eight to ten weeks.

Organized materials system reduces lead time

The majority of lead-time in a manufactured product is time spent waiting for parts to arrive from suppliers. SENS uses its Just-In-Time (JIT) materials system to compress material lead times (Figure 3 depicts material and information flows from and to suppliers.) SENS and its suppliers maintain materials in various stages of completion. For example, each workcell maintains small quantities of subassemblies to facilitate an immediate increase over the normal production rate.

Key suppliers also hold a quantity of the finished assembly they provide to SENS, thus allowing us to significantly increase our output without significantly increasing our lead times or on-hand inventory expense. Key suppliers also maintain stock of raw material from which their products are built.

FIGURE 3



Signals are automatically sent to suppliers to trigger restock of our parts bins as parts are consumed. SENS helps suppliers plan their factory capacity by providing a rolling 10-week production forecast for each item that suppliers provide. The result? Faster response time and higher quality. Because only small quantities of material exist at any one place in the JIT system, supplier quality problems can be found earlier and corrected faster than in other systems.

Competitive pricing

Traditionally, quality has been viewed as expensive. In poorly managed systems it is, in fact, very costly. Rework at the end of the line wastes large quantities

of time and material. In a well-managed production system, however, there is no costly rework at the end of the line. Problems that do occur are stamped out early, when the cost to fix them is low.

SENS value equation benefits YOU, the customer!

At SENS, we never forget that customer satisfaction drives our growth. Customers keep telling us that our value equation works well for them:

FIGURE 4

