CAPACITY MANAGEMENT

The term capacity, or plant capacity, is used to define the maximum rate of output that a plant is able to produce under a given set of assumed operating conditions. It is closely related to production rate. The assumed operating conditions refer to the number of shifts per day, number of days in the week that the plant operates, employment levels, whether overtime is included or not, and so on. Whether based on sales forecasts or specific customer's orders, production plans must be related to the actual productive capacity of the plant and to technical requirements of sequence and timing. The former may be accomplished through analysis of capacity, the latter through preliminary scheduling and knowledge of process limitations.

Although the objectives are the same, production planning problems and procedures vary considerably from industry to industry and from one type of plant to another. Planning problems emphasize inventory planning and transportation economics to a much greater degree than factors inherent in the production process itself. In a custom machine shop, on the other hand, machine capacity, alternative routing, and process balance occupies the planner's attention. Between the extremes lies a whole range of industrial situations that mix these elements in varying proportions.

Analysis of Capacity.
Harley-Davidson periodically requires our suppliers to prepare a plant or facility capacity analysis for all products indicating machine utilization, machine efficiency, labor efficiency, hours available, hours run, set up, process time, down and maintenance time, test and trial time, etc. Our interest is in ensuring that sufficient capacity exists without "bottlenecks" (*a bottleneck can be defined as an unmanaged, uncontrolled operation consuming an excessive amount of cycle time*) on all processes and equipment utilized to produce Harley-Davidson products.

Although there are many variables involved with capacity planning understanding basic equipment capacity will help develop the overall picture. There are several techniques and formulas for measuring capacity. In this section we have provided an example of one of the available techniques that suppliers may utilize. Suppliers must confer with the appropriate Harley-Davidson purchasing representative to ensure the techniques the supplier is using is acceptable to Harley-Davidson.

The following pages illustrate the formulas for analyzing Overall Equipment Efficiency and Capacity.

Overall Equipment Effectiveness:

OEE = Availability x Performance Efficiency x Quality Rate

where: **Availability =** (loading time – downtime) / loading time

Performance Efficiency = speed ratio x net operating rate

speed ratio = ideal cycle time / actual cycle time

net operating rate = amount processed x (actual cycle time / operation time)

performance efficiency = (ideal cycle time / actual cycle time) x amount processed x (actual cycle time / operation time)

Quality Rate = (amount processed - rejects -repaired parts) / amount processed

OVERALL EQUIPMENT EFFECTIVENESS
- EXAMPLE CALCULATION -

AVAILABILITY

Loading Time	460
Emergency Maintenance	30
Setup / Adjustment	15

PERFORMANCE EFFICIENCY

Ideal Cycle	0.67
Actual Cycle	0.80
Parts Produced	462
Operation Time	385

QUALITY RATE

Total Parts	462
Reject / Scrap Parts	16
Rework Parts	12

AVAILIBITY = (460-30-15)/460 = 90.2%

PERFORMANCE EFFICIENCY = 0.67/0.80 x 462 x 0.80/385 = 80.4%

QUALITY RATE = (462-16-12)462 = 93.9%

OVERALL EQUIPMENT EFFECTIVENESS = 90.2% x 80.4% x 93.9% = 68.1%

Capacity Calculation:

Capacity = $\frac{\text{Number of Hours Available}}{\text{Cycle Time}}$ x OEE x (# of Tools/Cavities/Stations)

Example: A die cast part with a two-cavity die

O.E.E.	68.1%
Cycle Time	60 seconds
Hrs/Day	6 hours

Capacity = $\frac{\text{6 hrs X 3600}}{\text{60 sec.}}$ x 68.1% x 2

Capacity = 490.3 Pieces Per Day