

Diagnostic Questions: Does the company manage its equipment to minimize equipment-related losses and extend equipment life?
 Is the company actively improving its product quality and equipment availability and efficiency by involving maintenance personnel and manufacturing engineers together on equipment improvement teams?
 Do equipment improvement teams have a well-designed program of improvement linked to the company's overall strategy and policy?
 Are equipment operators involved on teams to investigate and share improvement ideas with engineers and maintenance personnel?
 Does the company systematically measure, analyze, and control optimal conditions of tools, dies, jigs, fixtures, and calibration equipment?
 Do operators and maintenance personnel understand the relationship between equipment conditions and quality performance?

Level 1 Plan	Level 2 Apply	Level 3 Deploy	Level 4 Integrate	Level 5 Excel
<ul style="list-style-type: none"> ▪ No ongoing improvement activities; occasional projects initiated by engineering when critical equipment fails ▪ Ineffective communication between production, engineering, and maintenance ▪ Individual equipment histories, where they exist, give inadequate information for failure analysis ▪ Maintenance activities only manage results, corrective action often delayed; quality performance and equipment performance are monitored separately, hiding key factors ▪ Tools, dies, jigs, calibration equipment are in disarray and difficult to find 	<ul style="list-style-type: none"> ▪ Maintenance and Engineering work within cross functional teams with operators to restore equipment to "like new" conditions ▪ Equipment loss is baselined and monitored on constraint equipment using the Overall Equipment Effective (OEE) measurable ▪ Cross-functional improvement teams formed to evaluate OEE data to eliminate the 7 big equipment losses ▪ Focus on reducing variability in failure intervals (MTTF) by reducing and preventing deterioration ▪ Efforts to address causes of accelerated deterioration begin to reveal the connections between equipment conditions and quality performance ▪ OEE 40%--> 65% 	<ul style="list-style-type: none"> ▪ Model equipment established in initial application area (all equipment restored and improved) ▪ OEE data collected routinely and paretoed by the 7 big equipment losses ▪ Teams have performed OEE gap analysis and have implemented tools i.e., quick changed over and mistake proofing ▪ Once sporadic failures are eliminated, teams focus on chronic and hidden speed losses ▪ Focus is on extending equipment life by addressing design weaknesses and partnering with equipment vendors to make machine modifications ▪ Establishment of optimal conditions in critical equipment reduces the array of factors influencing quality performance ▪ OEE 65%-->75% 	<ul style="list-style-type: none"> ▪ All critical equipment and processes are managed through the LEM process ▪ Cross-functional teams establish and maintain conditions for zero unplanned downtime losses ▪ Maintenance is driven through data analysis and reliable team based problem solving methodologies ▪ Many of the 7 big equipment losses routinely show zero unplanned downtime ▪ Processes highly capable, with little variability ▪ Quality is assured by identifying and tracking equipment conditions that control quality results ▪ Zero defect conditions for equipment tools, dies, jigs, tools, and calibration equipment are studied and standardized, and managed through visual controls ▪ OEE 75%-->85% 	<ul style="list-style-type: none"> ▪ Many lines routinely reporting zero unplanned downtime losses ▪ Variability very low ▪ Process equipment constraints have been elevated and equipment effectiveness is now measured through "reliability growth" of all equipment in the process ▪ 100% quality routinely guaranteed through equipment controls, using poka-yoke devices (error-prevention systems), visual controls, and condition monitoring ▪ Equipment improvements and modifications are documented and "book shelved" for use by early equipment management teams ▪ OEE at least 85% or better ▪ Reliability growth trends upward