Visual Systems for Improving Equipment Effectiveness

(Source: http://www.tpmonline.com/articles_on_total_productive_maintenance/tpm/visualsysts.htm)

by Bob Williamson

Imagine reducing your equipment-specific training time by 60 to 70 percent and eliminating equipment errors. It is possible by using some easy techniques, known as "visual systems" or "visual signals" that communicate specific information quickly at the point of use on and near the equipment. Equipment effectiveness can be improved significantly by:

- **Determining what kinds of critical information will make the equipment easier to operate, maintain, and inspect**
- **Determining the correct information and a reliable application method**
- **Applying the critical information**

Some examples of visual systems for improving equipment effectiveness include applications:

- **On the equipment**
- **In the spare parts room**
- **In the area near the equipment**
- **Visual procedures and work instructions**

On the Equipment

- **Marking the proper operating ranges on temperature, pressure, flow, and speed gauges (Figure 1)**
- **Labeling equipment components to take the mystery out of nomenclature and maintain accurate equipment repair history**
- **Labeling lubrication and fluid fill points (Figure 4)**
- **Marking directions of flow, feed, or rotation to prevent installation errors**
- **Applying temperature-sensitive recording labels to critical machine components to provide a 24-hour-a-day visual monitoring of hydraulics, electrical components, bearings, motors, etc.**
- **Using color-coded grease fitting caps to protect and designate lubrication types and frequency**
- **Permanently attaching vibration analysis pickup discs to equipment and applying identification labels for reliable and repeatable vibration monitoring**
- **Labeling replacement belt, filter, chain sizes and part numbers on the equipment to save time looking up replacement part numbers**
- **Color-coding setup and changeover parts for specific product sizes**
- **Using problem tags to pinpoint the location of machine problems and to request maintenance using a visual "action board" (Figure 2)**
- **Labeling pneumatic lines and devices to aid troubleshooting**
- **Labeling electrical and electronic wiring and devices to aid troubleshooting**
- **Match-marking nuts and bolts to visually indicate that proper tightness is being maintained**

- Labeling inspection points and gauge reading sequence numbers (Figures 1 & 3)

FIG # 1 GAUGES WITH OPERATING RANGES

FIG # 2 PROBLEM TAG

FIG # 3 WHAT ARE WE READING? IN WHAT ORDER?

FIG # 4 CLEAR MARKINGS ELIMINATE ERRORS

In the Spare Parts Room

- Using shaft targets as a reminder to rotate motor and fan shafts while in storage to prevent "false brinelling" of bearings and armature sag due to lack of rotation
- Inventory control cards with photograph of parts, part numbers, lead time for re-ordering, supplier or source, minimum / maximum levels
- Reorder signal cards placed at the minimum inventory level

In the Area near the Equipment

- Equipment action boards in the plant communicate performance trends and improvements
- Visual preventive maintenance (PM) schedules showing when PMs are due, past due, and completed for the entire year

Visual Procedures and Work Instructions

- Photographs and small drawings used to show important points in procedures
- Photographs used to show where to inspect or adjust
- Photographs used to show where to get equipment readings for a shift inspection log sheet (Figure 5)

Visual systems for improving equipment effectiveness are an

extension of the "visual factory" or the "visual workplace." Where the visual factory deals with workplace organization and orderliness to eliminate waste and mistakes, the visuals applied to the equipment truly make them easier to operate, maintain, and inspect.

For more information, see the second edition of the book *Visual Systems for Improving Equipment Effectiveness* by Robert M. Williamson. Visit Strategic Work Systems' web site or call (864) 234-3100. Strategic Work Systems also offers many visual systems supplies, such as gauge marking labels, problem tags, and grease fitting caps. See the web site for more details or call for a catalog.

About the Author

Robert (Bob) Williamson is a workplace educator with more than 30 years or experience helping companies and workgroups improve the performance of their equipment and work processes through applied education and training. His background in maintenance mechanics, special machine design, and teaching vocational/technical courses has prepared him for a career that has taken him into well over 300 plant and company locations assisting with operations and maintenance training, Total Productive Maintenance development, multi-skill maintenance job design, and pay-for-applied skills design. He formed Strategic Work Systems in 1992 to focus on the people-side of world class manufacturing and maintenance.

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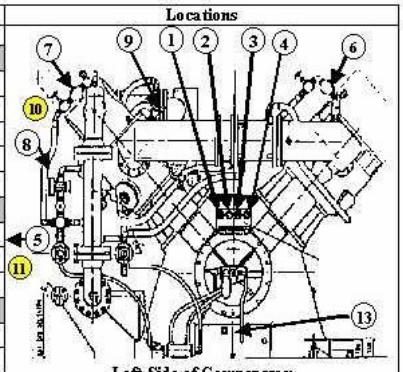
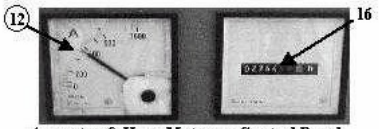
FIG # 5 EXAMPLE OF MANUFACTURER'S DIAGRAM WITH INDICATIONS

No	Checks (see "Operator PM Instructions")	Units	Normal Reading	Actual Reading	
				On Load	Off Load
	PRESSURE				
1	Oil Pressure	BAR	2 to 6		
2	1st Stage Air Pressure	BAR	3 to 3.5		
3	2nd Stage Air Pressure	BAR	14 to 15.5		
4	Final Air Delivery Pressure	BAR	40 to 45.5		
5	Air Receiver	BAR	40		
	COOLING				
6	1st Stage Cyl. & Intercooler	M^3/h	5.5 to 6.5		
7	2nd Stage Cyl. & Intercooler	M^3/h	6		
8	After Cooler	M^3/h	7		
	AIR TEMPERATURE				
9	1st Stage Delivery	° C	40		
10	2nd Stage Delivery (opposite side) (10)	° C	30		
11	After Cooler (opposite side) (11)	° C	25		
	OTHER				
12	Ammeter	Amps	< 410		
13	Crankcase Oil Level (30W)	--------	Half Glass		
14	Test Panel Lamp Operation	--------	All Light		
15	Check Load/Unload Operation	--------	Unloads		
16	Hour Meter at Start of Shift	Hours			

Locations



Left Side of Compressor



Ammeter & Hour Meter on Control Panel

Remarks:

(continue on reverse side if needed)

Signatures Dates & Routing	
	Operator:
	Supervisor/Team Leader:
	Maintenance Engineer:
	Equipment History File: