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Condition Management Analysis and Program Metrics

As condition entries and assessment tasks are processed through Tango™, plantwide and area specific condition based maintenance metrics are produced.

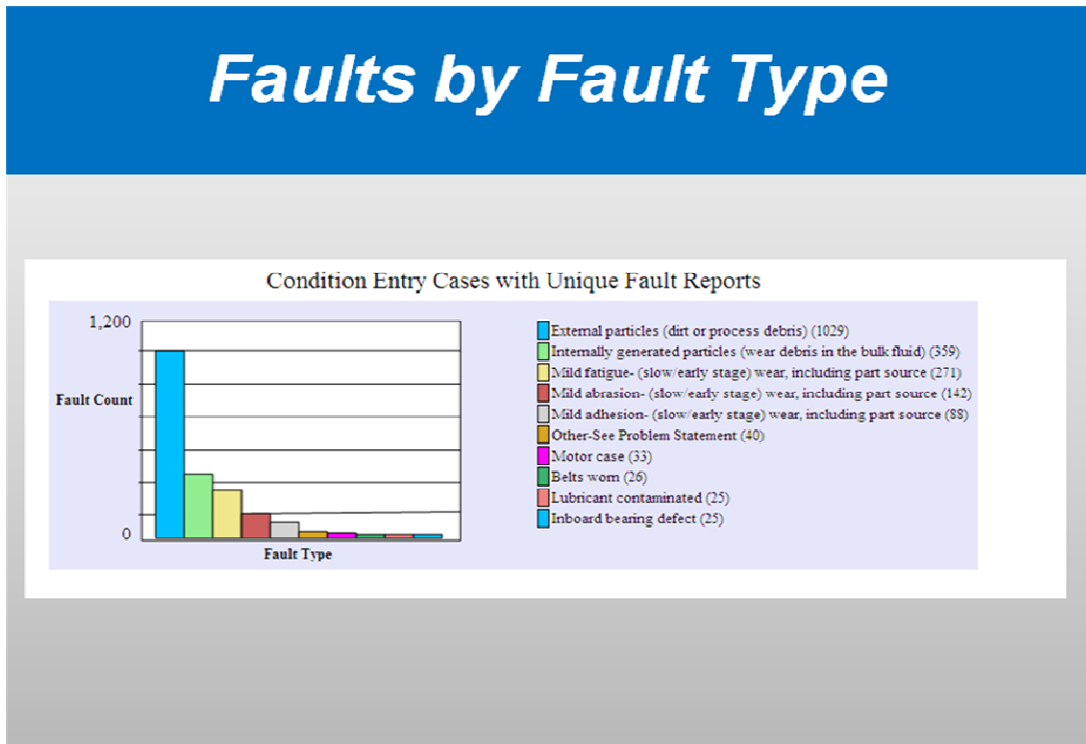


Figure 1: Faults By Type

Figures 1 and 2 provide an analysis of equipment faults found by condition monitoring. From this analysis, basic patterns of reliability needs are presented. As presented by Figures 1 and 2, the most frequent reliability problem in this plant is in gearboxes and the most frequent fault is contamination.



Faults by Equipment Type

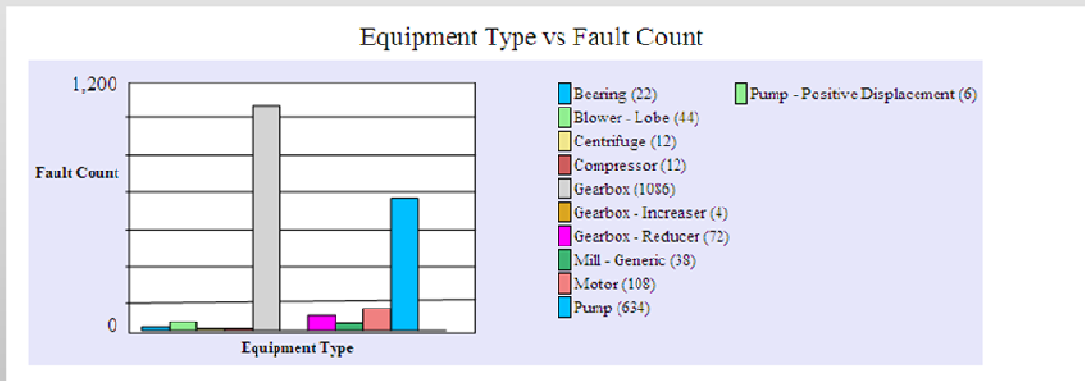


Figure 2: Faults By Equipment Type

Tango™ also provides analysis of recurring failures. Locations with multiple failures and equipment types with common failure patterns can be listed.

The process of managing a condition based maintenance program is aided by Tango's program metrics, as seen in Figures 3 and 4. These trend plots illustrate Tango's ability to present program results in terms of repair activities.



Program Metrics

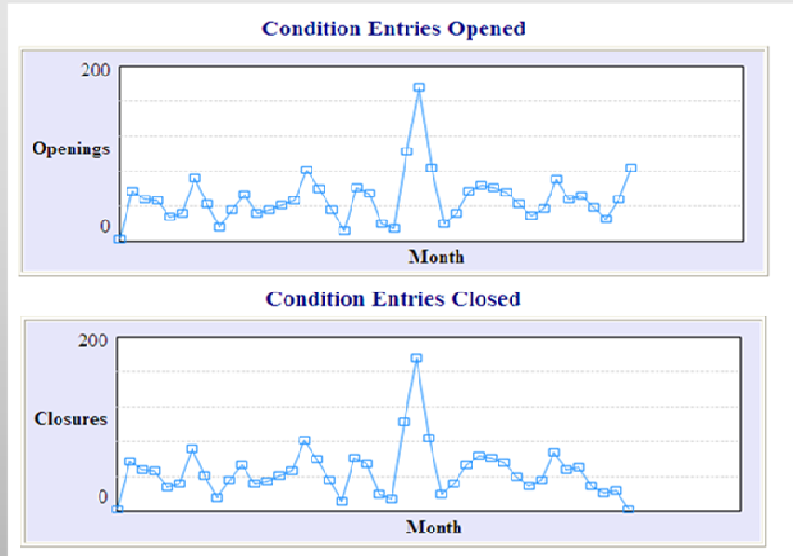


Figure 3: Program Metrics

Program Metrics

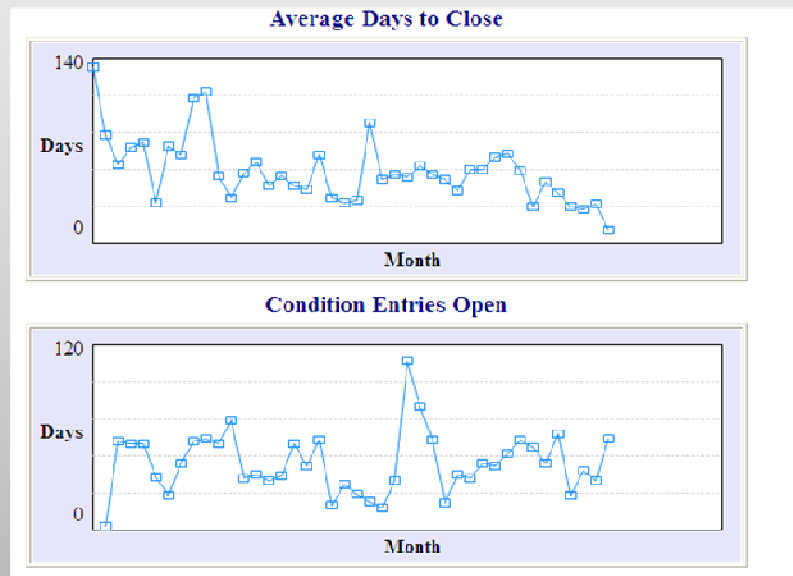


Figure 4: Program Metrics



Equipment Management Analysis and Program Metrics

Equipment management analysis provides information on the equipment problems and repairs in a time period, the root cause of failure, MTBF, and cost of failure. This information is obtained from multiple sources as the equipment is installed, removed, repaired and re-installed.

The equipment tracked in Tango™ receiving the most repairs is presented in Figure 5 and the cost of these repairs is provided in Figure 6.

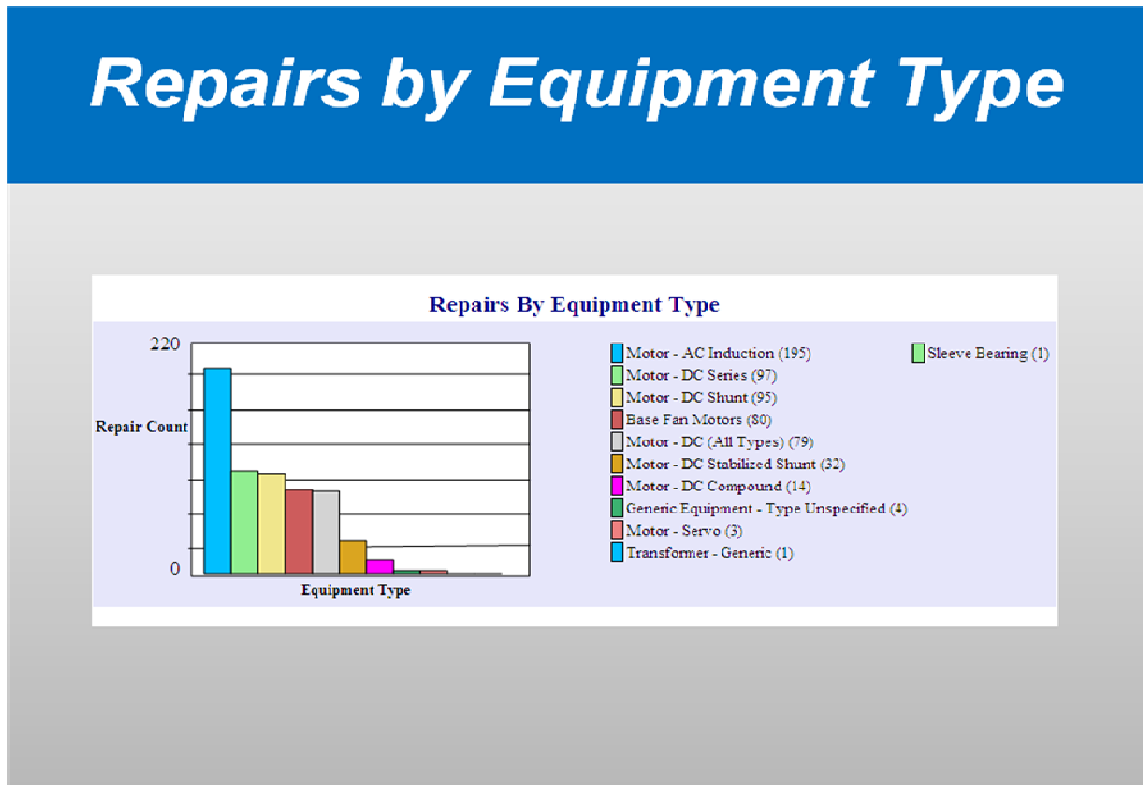


Figure 5: Repairs by Equipment Type

One basic measurement of reliability is “Cost of Failure.” Tango™ provides this analysis by equipment type (Figure 6 and 7) and by location. The cost by location analysis allows the highest cost (most repairs) locations to be easily identified. The cost analysis (Figure 8) is a tool to allow reliability improvement initiatives to be focused on locations with the greatest opportunity to reduce maintenance costs.

Repair Cost by Equipment Type

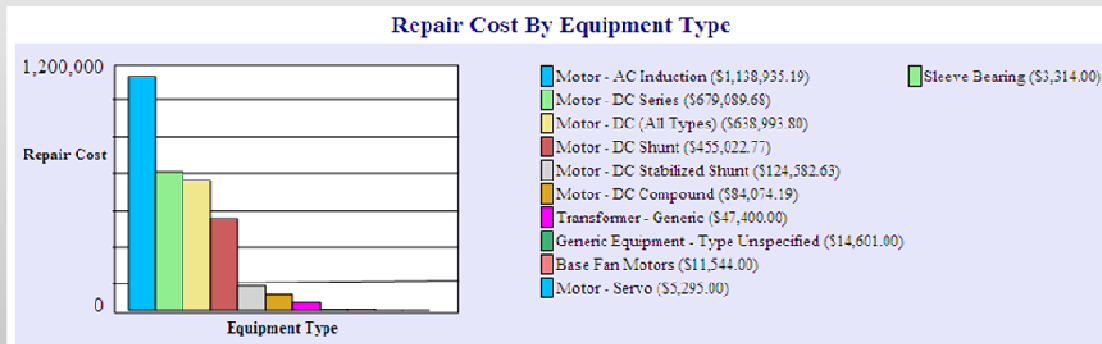


Figure 6: Repair Cost by Equipment Type

Average Cost by Equipment Type

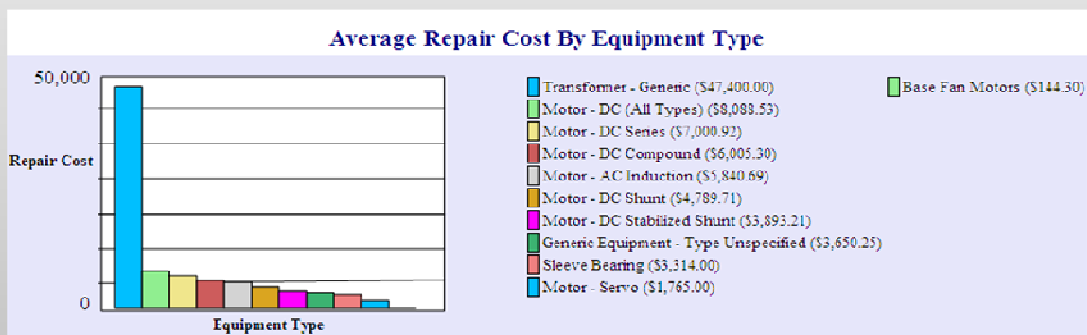


Figure 7: Average Cost by Equipment Type



Repair Cost by Location

🏭	\$11 Ingot Plant	{ \$895,933.17 / 84 Repairs }
🏭	\$70 NP Compressor House	{ \$41,970.00 / 12 Repairs }
🏭	\$13 HL Ingot Pad	{ \$75,594.00 / 32 Repairs }
🏭	\$22 Strip Shears & Slitters	{ \$64,465.00 / 32 Repairs }
🏭	\$17 CCM	{ \$20,901.00 / 8 Repairs }
🏭	\$54 Roll Shop	{ \$121,440.00 / 30 Repairs }
🏭	\$01 Cooling Tower	{ \$338,822.43 / 86 Repairs }
🏭	Tower	{ \$338,822.43 / 86 Repairs }
🏭	CLDWELL	{ \$242,645.43 / 54 Repairs }
🏭	MOTOR1	{ \$54,252.67 / 12 Repairs }
🏭	MOTOR2	{ \$21,122.00 / 7 Repairs }
🏭	MOTOR3	{ \$42,570.00 / 7 Repairs }
🏭	MOTOR4	{ \$49,690.00 / 12 Repairs }
🏭	MOTOR5	{ \$25,893.76 / 7 Repairs }
🏭	MOTOR6	{ \$49,117.00 / 9 Repairs }
🏭	FANS	{ \$1,180.00 / 4 Repairs }
🏭	HOTWELL	{ \$94,107.00 / 27 Repairs }
🏭	OILSEPR	{ \$890.00 / 1 Repairs }
🏭	\$10 Preheats & Scalper	{ \$325,208.65 / 156 Repairs }
🏭	\$14A 7.5 Ton Crane	{ \$0.00 / 1 Repairs }

Figure 8: Repair Cost by Location

Mean time between failure is another basic measurement of reliability. This metric focuses reliability attention on the most significant problems and provides validation of improvement over time.

MTBF

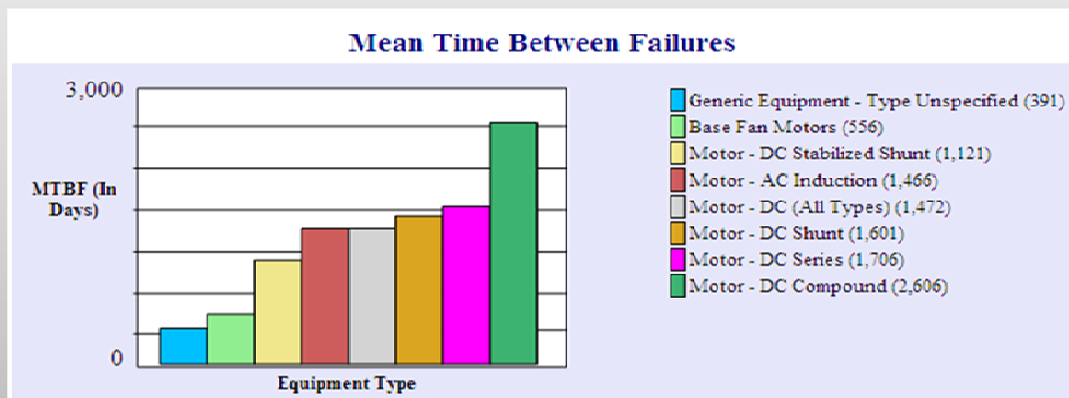


Figure 9: MTBF

Cause of failure analysis needs to be structured such that the root cause of failure is identified. Tango™ provides this ability. One focus of reliability is to make equipment live longer between overhauls. This focus is accomplished by understanding a location's or an equipment's most common root cause of failure and eliminating the problem.

Failures by Failure Type

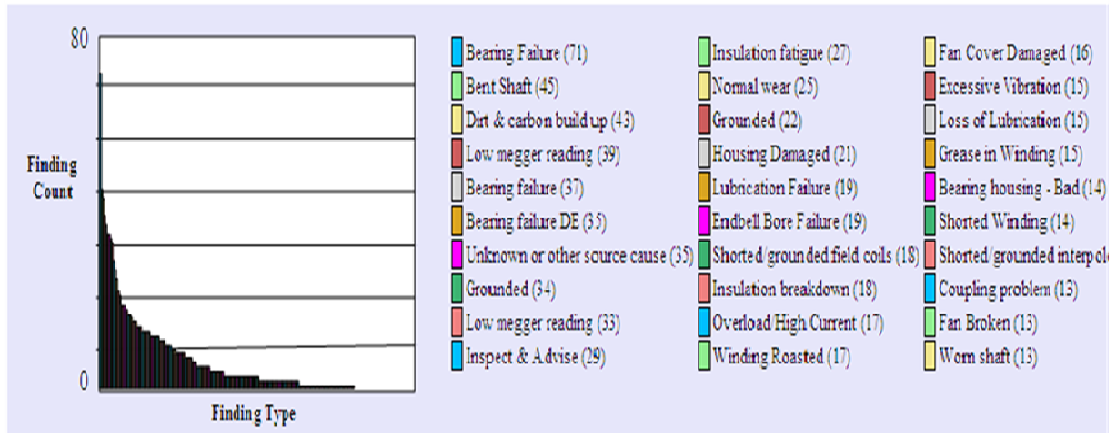


Figure 10: Failures by Failure Type

Program metrics that reveal which vendors are repairing equipment (Figure 11), each vendor's average cost of repair for an equipment type or stock number and comparison between vendors are also available in Tango™.

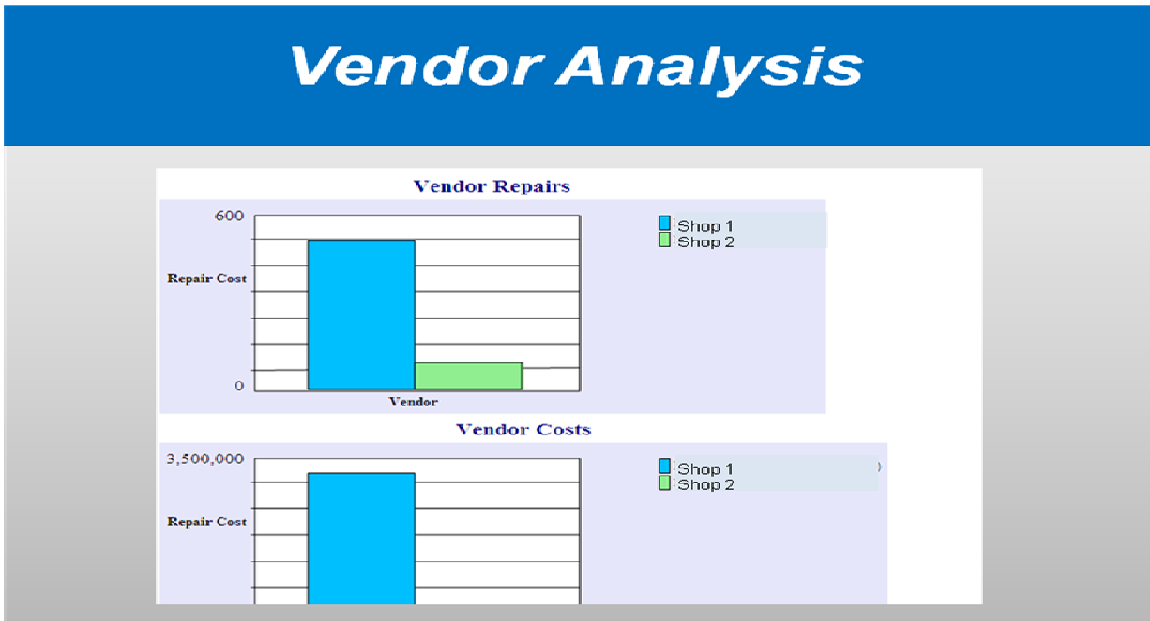


Figure 11: Vendor Analysis



Program performance trends of repairs per month and repair cost per month by equipment type or area, are also available in Tango™.

Repairs per Month

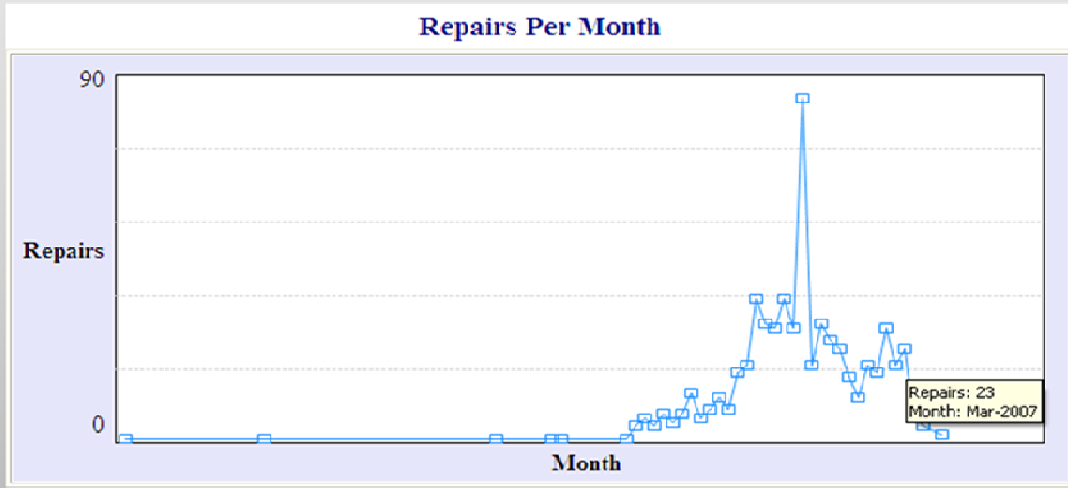


Figure 12: Repairs per Month

Repair Cost by Month

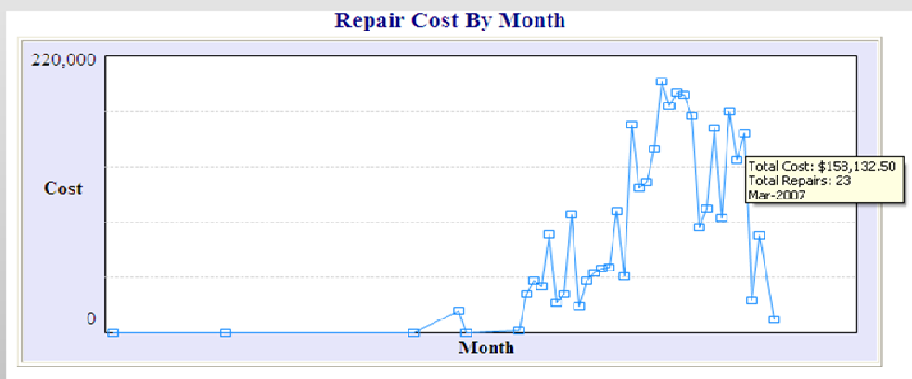


Figure 13: Repair Cost per Month

