

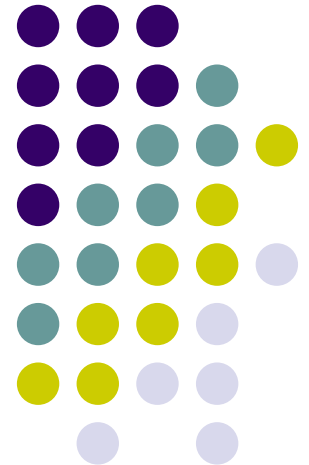
*SIRF Roundtables*



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Common Interest Working Group

CONDITION MONITORING

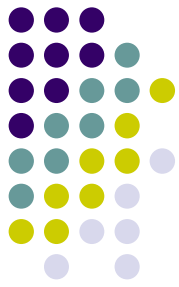


# PROGRAM DETAILS



- Alignment of CM Practices with Business Operating Strategies - SA Brewing Company
- Implementation and Training – Adelaide Brighton Cement Birkenhead
- Outsourcing Options & Strategies - TRU Energy
- Techniques - Zinifex, Port Pirie
- Management of Information & Handling Outcomes – MMAL
- Condition Monitoring of Site Assets – Adelaide Airport

# ATTENDANCE



- 18 Companies
- 37 People

# ALIGNING CM STRATEGIES WITH BUSINESS STRATEGIES



- Condition monitoring is an effective tool for detecting a defect which may cause a future failure.
- It is a non intrusive technique which, when used in combination with Root Cause Analysis, can improve asset utilisation and extend asset life.
- As asset utilisation is improved and asset life is extended companies achieve
  - Increased productive capacity by improving on line equipment efficiency; and
  - Reduced maintenance costs.

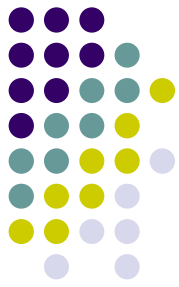
# CASE STUDIES



- **Adelaide Brighton Cement** has
  - Increased the time between planned shut downs; and
  - Reduced the length of the shut downs
- The **SA Brewing Company** has placed much greater emphasis on using condition monitoring to improve plant availability and performance and as a result it has:
  - Reduced expenditure on seal replacements to less than \$5,000 per annum by improved vibration monitoring; and
  - Increased condensate recovery to 80% by ultra sonically testing steam traps to ensure that they are working correctly.



- **Santos** has established a permanent strategy group to review and improve its PM program
- This is based on minimising the impact of failure by emphasising the use of condition monitoring.
- A total of 16,000 hours of preventative maintenance work, or 28% of the previous work carried out is no longer required. This represents an estimated cumulative saving of \$1.7m per annum.
- However Santos cautions that it is still too early to be sure that the new strategy is working as well as anticipated.



**TRUenergy** is using thermal imaging to detect leaking valves on its condensers and as a result has improved its thermal efficiencies

# ALTERNATIVE CM TECHNIQUES IN COMMON USE



- Vibration analysis that may be either interval based or continuous online monitoring;
- Ultrasonic and other non destructive testing such as magnetic particle testing;
- Oil analysis;
- Thermography of electrical equipment especially of switchboards;
- Motor current analysis;
- Automatic process control of process variables such as flow rates, temperatures, pressures, levels and quality; and
- Chemical analysis of boiler feed water and cooling water.
- In many plants there is strong emphasis on visual inspection by both operators and maintainers using sight, touch and sound.

# NEWER TECHNOLOGIES/APPROACHES

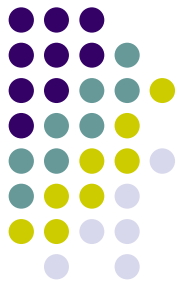


- Partial discharge on critical motors;
- On line scanning to indicate trend lines and wear;
- HV motor testing;
- Magnetic particle surveys of gear boxes;
- Non invasive pipeline testing such as sedimentation analysis and core sampling;
- Visual testing is important with site assets (litmus tests)



# TRAINING AND IMPLEMENTATION

# WHAT CAN BE DONE TO HELP IMPLEMENTATION



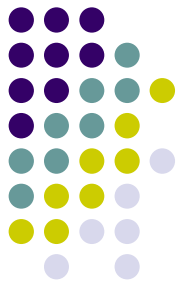
- Ensure that maintenance planning is primarily condition based rather than time based.
- Know the health of the plant and the cost of potential failures;
- Ensure all condition monitoring work gets done; if necessary bring in contractors to ensure work is completed within the time constraints;
- Promote the concept of condition monitoring, record the wins and promote the savings;
- Physically cost the savings and losses;

# WHAT HINDERS IMPLEMENTATION



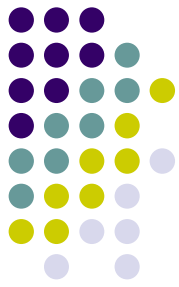
- Not analysing data sufficiently well and making wrong calls and identifying non existing problems or alternatively missing real problems;
- Using condition monitoring technicians in a dual role where there is excessive fire fighting;
- Not involving operators in condition monitoring discussions and in assisting with condition monitoring work;
- Poor knowledge of condition monitoring requirements;
- Poor systems that divert attention away from problem solving. Examples are excessive meetings, paperwork and poor coordination of non core work.

# BENEFITS OF TRAINING AND ENGAGEMENT



- It indicates positive and visible management commitment;
- Commitment to training and education improves skills development;
- Better alignment of business, maintenance and operational goals will deliver a more reliable and consistent approach with less hassles for everyone;
- Improved training will result in a greater skill level, improved safety performance and this will result in a less stressful work place;
- Participation in the training program will develop improved team work and greater involvement of both operators and maintainers.

# IMPLEMENTATION STEPS



- Develop an understanding of what is failing, how often and why by carrying out a GAP analysis;
- Look at case histories and benchmark performance against other plants in similar industries;
- Use RCA and FMECA to analyse problems and to determine maintenance strategies;
- Analyse the cost benefits of implementing condition monitoring by looking at customer service levels and the cost of lost production and increased maintenance costs;
- Determine the critical plant items and analyse the cost of failure on each and determine how condition monitoring can be used to improve performance;



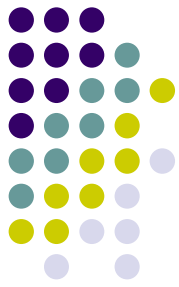
- Develop KPI's based on best practice to monitor changes in performance levels;
- Determine the cost of implementing condition monitoring in terms of manpower requirements, equipment costs and training costs;
- Develop a training program and determine who should be involved and whether you use internal or external trainers and facilitators;
- Start small with a progressive roll out across the plant; and
- Set the implementation time frame and communicate progress to management

# CRITERIA FOR DECIDING TO OUTSOURCE



- The company does not have the necessary equipment and in house skills to carry out the work;
- Better use of in house expertise as it enable engineers and technicians to concentrate on high level analysis work and development of maintenance strategies rather than on lower skill data collection;
- Cannot maintain skill levels because of high staff turn over;
- Cost to outsource is lower and it eliminates the need to purchase expensive plant and equipment that is difficult to justify economically.

# SELECTION CRITERIA FOR CONTRACTORS



Short listed contractors must:

- Have the appropriate quality systems supported by current software packages;
- Be capable of presenting data in a manner that is consistent with the plant's data base;
- Be capable, when required, of carrying out analysis of the data and recommend solutions to problems;
- Work closely and in a harmonious way with site personnel; and must have
- Sufficient staff to support the company's needs and requirements.

Once a contractor has been able to satisfy these criteria price negotiations can commence. The price of call outs is a key element to be considered during price negotiations.



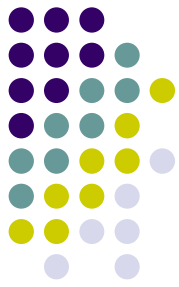
# **MANAGING CM INFORMATION AND HANDLING OUTCOMES**

# DATA COLLECTION



- Data must be collected by appropriately trained people.
- Operators have daily rounds and can be used to collect basic condition monitoring data.
- When vendors are used for condition monitoring tasks the information provided by them must have been audited and provided within a relatively short turn around time.
- Recommendations arising from the data collection and review must be provided to the asset manager to enable him/her to adequately manage the risk;
- Data should be validated as it is collected to ensure its veracity. Where there is any doubt readings should be repeated;
- The frequency of data collection depends on the mode of failure and criticality of the plant. The greater the criticality of failure the higher the frequency of the condition monitoring;
- The same monitoring points should be used for consistency especially for vibration analysis;

# USING THE CM DATA



- The CM data should be used to develop maintenance strategies and regimes.
- These should be structured to allow the maintenance approach to change smoothly from traditional preventative maintenance progressively through predictive maintenance to proactive maintenance;
- When using CM data we need to recognise that different maintenance regimes must be developed for stand alone equipment and that which is spared or has an element of redundancy;
- It is essential to review data collected by:
  - Carrying out a Pareto analysis of failures;
  - Analysing Mean Time Between Failures; and then
  - Carrying out a Root Cause Analysis of the main problems.