Capturing the Knowledge of an Aging Workforce

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What is the aging workforce? A popular topic often referenced in discussion and rhetoric, the aging workforce points to the baby boom generation. Baby boomers, generally defined as those individuals born between 1946 and 1964, will typically become eligible for retirement and begin to retire in high numbers over the next few years. Recent studies conducted throughout industry have revealed that more than 30-40% of maintenance trades people will be retiring over the next 5 years; in some industries that rate is as high as 50%.

During their years on the job trades people collect a wealth of knowledge that is rarely documented or transferred to others. Well-seasoned maintenance veterans are intimate with their equipment and can quickly make repairs to avoid downtime. The knowledge they often posses is asset criticality, inspection knowledge and general know-how pertaining to the maintenance of these assets. This critical information is often memorized or squirreled away in some secret notebook that these tradesmen use daily. All of this knowledge is lost, as employees retire, in companies that are unable to systematically collect the information as the employee conducts his/her job. As the eligibility of workers who can retire rises over the next five to ten years the opportunity to capture the knowledge of the aging workforce multiplies exponentially. At the same time fewer people are entering the trades. Apprenticeship programs are at their lowest levels and enrollment at educational institutions has dropped by 60% over the past 10 years.

Unfortunately, many organizations do not realize their loss until the impact is felt, often resulting in a loss of efficiency or setbacks for important strategic goals. Any increase in turnover, caused by retirement or other reasons, puts more institutional knowledge at risk and increases the need for an effective knowledge management strategy.

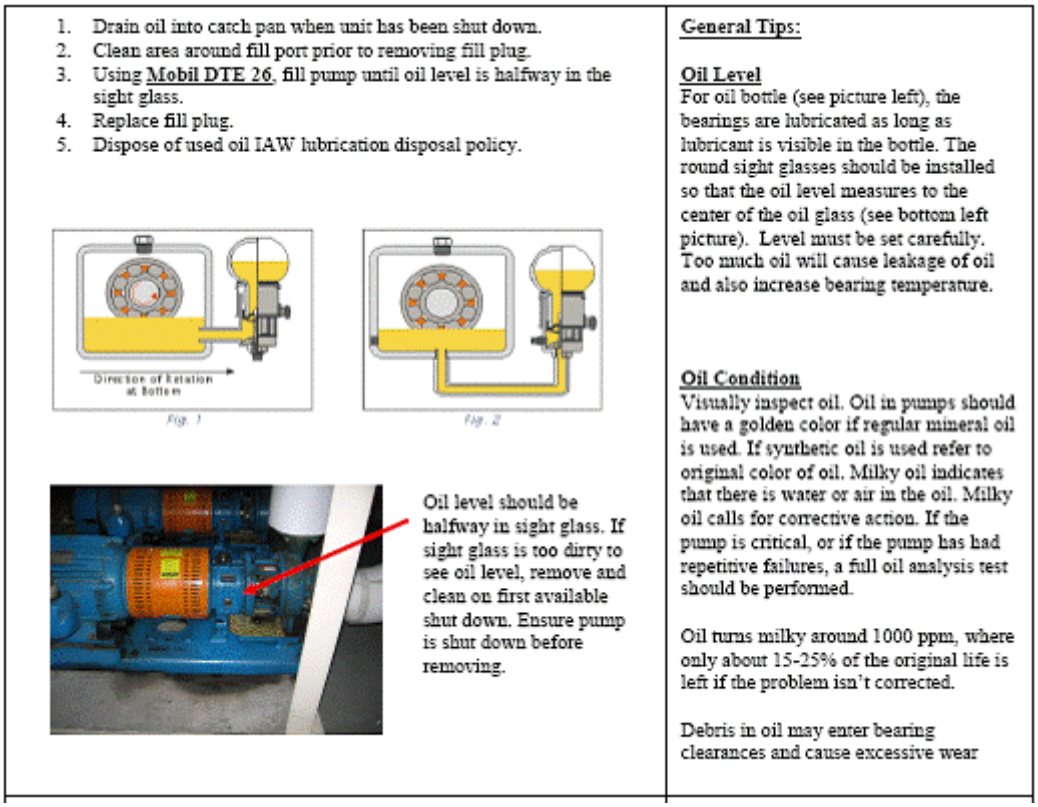
Therefore, companies must take action and recognize this impending dilemma. They must take a long hard look at the current workforce and identify where the shortages are going to be and develop a path forward. The end result is that companies may find themselves with fewer employees on hand to run plants just as they are seeking ways to extend their equipment life. Companies must take a proactive approach and develop an Effective Knowledge Management Plan to ensure they are prepared for the upcoming changes that they will most likely face. The following are the Four Key Components for an Effective Knowledge Management Plan.

Key Components for an Effective Knowledge Management Plan:

- Documentation of standards and procedures
- Cross-training
- Centralized archives or storehouse of records
- Job shadowing or mentoring

Documentation of standards and procedures
Standards create a professional environment of “best practice” procedures. They enable organizations to confidently create systems, policies and procedures, maintain autonomy from vested interest groups and assure high operation quality that leads to exceptional records and information management performance. Establishing standard operating procedures and documenting policies and procedures are the first step because many organizations still lack documented policies, procedures and related manuals. When creating these documents you must use the “tacit” and “explicit” knowledge. Tacit knowledge includes what is sometimes called "tribal knowledge”. If we look at the typical task for an operator or maintenance personnel to conduct a routine inspection in his/her assigned area, the explicit knowledge related to the task may be provided in a checklist or procedures specifying the frequency of these inspections, and the information to be collected (See Fig. 1). The associated tacit knowledge may include the recognition of abnormal conditions or potential problems

based upon any of the five senses (See Fig. 2). There is not a clear division between explicit and tacit knowledge but rather a spectrum. For us explicit knowledge is primarily about what to do and how to do it and tacit knowledge is how it is to be done. It is this knowledge that we must capture when creating documents and standards and it is this vital information we must capture before our workers retire.



1. Drain oil into catch pan when unit has been shut down.
2. Clean area around fill port prior to removing fill plug.
3. Using **Mobil DTE 26**, fill pump until oil level is halfway in the sight glass.
4. Replace fill plug.
5. Dispose of used oil IAW lubrication disposal policy.

Fig. 1 Fig. 2

Oil level should be halfway in sight glass. If sight glass is too dirty to see oil level, remove and clean on first available shut down. Ensure pump is shut down before removing.

General Tips:

Oil Level

For oil bottle (see picture left), the bearings are lubricated as long as lubricant is visible in the bottle. The round sight glasses should be installed so that the oil level measures to the center of the oil glass (see bottom left picture). Level must be set carefully. Too much oil will cause leakage of oil and also increase bearing temperature.

Oil Condition

Visually inspect oil. Oil in pumps should have a golden color if regular mineral oil is used. If synthetic oil is used refer to original color of oil. Milky oil indicates that there is water or air in the oil. Milky oil calls for corrective action. If the pump is critical, or if the pump has had repetitive failures, a full oil analysis test should be performed.

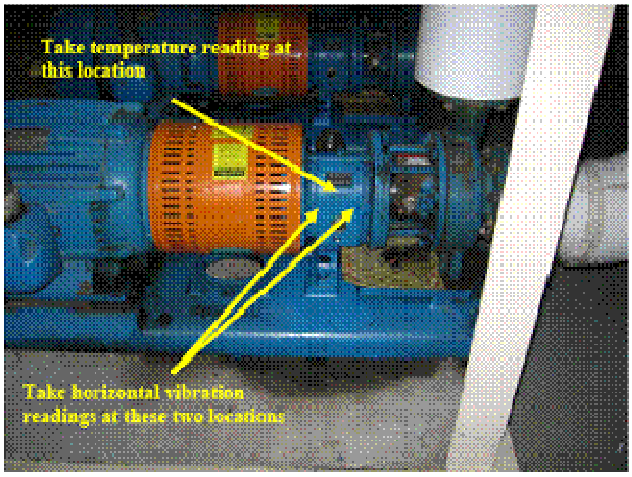
Oil turns milky around 1000 ppm, where only about 15-25% of the original life is left if the problem isn't corrected.

Debris in oil may enter bearing clearances and cause excessive wear

Fig. 1 Example of a detailed lubrication inspection.

Check pump for abnormal noise and vibration. Cavitation sounds as small stones are going through the pump. Air bubbles implode around the impeller and chips off small metal particles, often due to "starvation" on the inlet side or increased pressure on the discharge side. Cavitation also causes high vibration in the pump.

When taking vibration readings with a vibration pen, it is usually enough to take the vibration reading in the horizontal plane. The highest vibration value will usually appear in the horizontal plane. Too ensure the reading is compatible with the last reading taken on the pump take readings at the marks placed the pump in the horizontal position.



Check bearing temperature with an infrared temp gun. Ball and roller bearings should not have a temperature exceeding 170 deg F. Take temperature readings at the same location the vibration readings are taken.

Ensure coupling guard is in good condition and fully installed.

Date: Operator:	Motor Temperature (deg F): _____ **If temperature exceeds 170 deg F write work order**
Drive End Bearing Vibration Reading (in/sec): _____ **If vibration level exceeds .300 in/sec write work order**	Opposite Drive End Bearing Vibration Reading (in/sec): _____ **If vibration level exceeds .300 in/sec write work order**

General Tips:

Noise and vibration is caused by:

- Cavitation
- Entrained air
- Pump or drive not securely mounted
- Impeller clogged or damaged
- Bearing damage
- Misalignment or coupling wear

Any substantial change in temperature usually indicates some fault:

- Excessive lubrication
- Insufficient lubrication
- Bearing damage
- Overload
- Induced vibration
- Shaft misalignment
- Imbalanced impeller

Normal operating temperatures should not exceed 30 deg F higher than ambient temperature. Temperature will vary due to speed, load and condition of lubricant.

General Purpose horizontal pump – direct coupled vibration levels:

0-.200in/sec	Good
.200-.300in/sec	Fair
.300-.450in/sec	Alarm 1 (Warning)
.450in/sec & up	Alarm 2 (Fault)

Temperature Levels:

Ambient – 130 deg F	Good
130 deg F – 150 deg F	Fair
150 deg F – 170 deg F (Warning)	Alarm 1
170 deg F & higher (Fault)	Alarm 2

Issues with this pump due to high vibration, high temperature or any other issue write work order.

Fig. 2 Example of the Tacit and Explicit knowledge captured in an SOP.

Cross Training

Cross-training is training an employee to do a different part of the organization's work, allows multiple employees to learn to do a job and reduce an organization's risk if an employee leaves. This type of training becomes even more important for mission-critical tasks and processes that may be required to keep the organization operating or delivering service. Cross-training should be comprehensive so employees feel confident in their abilities to complete these other processes and responsibilities.

Centralized Archives or Storehouse of Records

While few organizations have a knowledge management plan in place, some organizations are undertaking some effort to record or store institutional knowledge. These efforts mirror those key components mentioned earlier and include requiring written manuals, documentation of processes and procedures or the development of a central database. Other strategies focus on records management such as document imaging systems and centralized archives. Finally, utilizing your companies computerized maintenance management system (CMMS) to its fullest extent by capturing all of the data possible for review and further decision making opportunities.

Job Shadow or Mentoring

An effective knowledge management strategy begins with understanding what knowledge is at risk and how losing this knowledge will impact the organization. This is not a simple task and will require a somewhat systematic review, especially with individuals that have deep institutional knowledge from long careers within the organization. Companies may choose to use different strategies from job shadowing to peer-to-peer knowledge (Mentoring) transfer.

Conclusions

Organizations in industry must take a proactive and direct approach to dealing with the issues associated with their aging workforce. They must take a long hard look at who is retiring and what knowledge is going to leave when they go. Companies must have appropriate countermeasures in place to capture the tacit and explicit knowledge that is vital for the continued success of their organization. Waiting until there is a crisis to try and figure out what happened or who knows what to do is too late. By capturing the vital knowledge of the aging workforce before they retire, organizations will be in the position to successfully handle the transitional changes from older personnel leaving to new personnel joining the organization. While each of these identified strategies and approaches are valid and valuable to knowledge management efforts, organizations must exert equal emphasis on capturing and managing all types of organizational knowledge.