SKILLS STANDARDS DEVELOPMENT AND COMPETENCY ASSURANCE FOR MACHINERY LUBRICATION TECHNICIANS - NEW INITIATIVES BY THE INTERNATIONAL COUNCIL FOR MACHINERY LUBRICATION

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SUMMARY
Today’s business environment has created renewed interest in the lubrication function. It is more a matter of survival than choice, but managers have realized that precision machine lubrication is necessary to achieve production reliability objectives, while minimizing life-cycle costs associated with asset ownership. Employing competent technicians in the lubrication crafts is critical to achieving business goals. Lacking expertise in all the technologies over which they are responsible, managers turn to third-party organizations to objectively evaluate and certify the competency of individuals providing important skills like machine lubrication, oil analysis, etc.

This presentation describes the role of the International Council for Machinery Lubrication in providing competency assurance for the lubrication technology crafts and details ICML’s vision for the future.

Keywords: lubrication, certification, ICML, International Council for Machinery Lubrication, Augustus H. Gill Award

1 INTRODUCTION
A nonprofit organization called the International Council for Machinery Lubrication (ICML) has been launched to advance causes associated with practical aspects of machinery lubrication in industrial and fleet applications. The purpose of ICML is simple: Help lubrication practitioners on a global scale to succeed in their professional careers. ICML will promote the interests of lubrication practitioners in a number of different ways and it will evolve in response to the changing needs of its constituents.

ICML charter is to serve the lubrication technology practitioner community with awards to recognize excellence; promote scholarship, including curriculum development, support of research and support of prospective lubrication technology and engineering students; develop lubrication and lubricant analysis standards and provide skill competency certification. This paper introduces the world tribology community to ICML, providing particular emphasis on ICML’s competency assurance activities.

2 ICML’S SCOPE OF SERVICES TO THE LUBRICATION COMMUNITY

2.1 Recognition of Excellence
When individuals and organizations accomplish the extraordinary, or perform ordinary tasks extraordinarily well, they contribute to the development of best practices and the advancement of the industry. ICML seeks to recognize these individuals and organizations formally with awards of excellence. The first of these awards is the Augustus H. Gill Award, which recognizes excellence in oil analysis. Other awards are planned for the future to recognize laboratories, new products and develop best practices in the field of machinery lubrication.

The Augustus H. Gill Award was formed to recognize organizations that have exhibited excellence in the application of used oil analysis in machine and lubricant condition monitoring. This distinguished award, honoring Professor Gill, was designed to motivate companies to improve machine reliability and maintenance quality through the application of oil analysis. As such, the focus of the award is not just to identify award recipients, but also to encourage performance of excellence and create a means to share best practices among user organizations on a global scale. In sum, the award should go a long way to raise the bar by recognizing role models for benchmarking and setting performance standards by the oil analysis community.

What are the qualities of a user organization that might receive the distinction of being an Augustus H. Gill Award recipient? Below is a list of some of the characteristics and criteria that the ICML Awards Committee will evaluate for organizations that apply.

- Commitment to Education
- Maintenance Culture and Management Support
- Performance Measurements Used
- Proactive/Predictive Maintenance
- Use of Standardized Procedures
- Technology Integration
- Contamination Control
- Lubrication Management
- Oil Analysis Methods and Strategies
- Use of Information Technology
- Continuous Improvement
2.2 Promotion of Scholarship

For our industry to continue its development, we must continue to create and disseminate machinery lubrication best practices. ICML will promote the development and transfer of knowledge related to machinery lubrication by funding applied research activities. It is hoped that in the future, ICML may endow professorships for academicians who are interested in devoting themselves to teaching, research and outreach in the machinery lubrication industry. Industry also needs qualified individuals trained in the machinery lubrication machinery lubrication crafts. ICML intends to help resurrect the lubrication curriculum at vocational and technical schools, and to create and promote the use of lubrication craft apprenticeship programs to provide interested individuals with a way to enter the lubrication field. In order to grow and succeed, the lubrication industry must attract bright, passionate individuals who are interested in making machinery lubrication their chosen field and profession. It is a goal of ICML to provide scholarship support to these young people who wish to enter the lubrication field.

2.3 Lubrication and Lubrication Analysis Standards Development Support

Activities are underway to develop used lubricant analysis standards. There is a clear need for additional standards in the areas of lubricant selection and application, contamination control, etc. ICML will serve as a rallying point for machinery lubrication practitioners to speak with a common voice by supporting the development of lubrication-related standards and guides. ICML is a voting member of the American National Standards Institute’s (ANSI) Technical Advisory Group S2 (TAG S2), the secretariat to ISO TC/108/SC5 and activity dedicated to the development of standards and guides for equipment condition monitoring and maintenance. ICML will produce standard documents and propose these for adoption by the ISO/TC108/SC5 committee.

2.4 Competency Assurance and Certification

Certification is the mark of a professional. It helps to ensure that individuals who practice a craft, be it lubricant analysis or medicine, have a defined measure of competency. For the field of machinery lubrication, formal certification serves the following three vital purposes:

- Create a formal framework of knowledge
- Raise the profile of those working in the field
- Provide managers with assurance of competency

To become certified by ICML, individuals must meet certain requirements. First, the individuals must meet experience requirements set forth for the certification they seek. Second, they must provide evidence that they have received the minimum required amount of relevant training about the subject on which they are being certified. And last, they must pass a written examination. Because skills deteriorate and knowledge changes, certified individuals must recertify by examination or by showing proof of sufficient relevant activity in the area of their certification.

ICML presently offers certification for the Machine Lubricant Analyst (MLA), Machine Lubrication Technician (MLT) and Laboratory Lubricant Analyst (LLA). Plans exist to offer certification at two levels, but a third level may be added if required. The certification types were selected because they represent the natural division of tasks in the field. The objectives for each certification and level are summarized in Table 1. ICML intends to have all of its certifications comply with the requirements of the pending ISO/CD 18436 Standard and the National Commission for Certifying Agencies (NCCA), and be “certified” as valid certifications.

3 A CLOSER LOOK AT ICML COMPETENCY ASSURANCE CERTIFICATION

Despite its importance to the profitability of the plant, the task of machinery lubrication is not highly esteemed. Often, lubrication technicians occupy the low end of the pay scale. When a lube tech exhibits promise, he or she is often promoted to mechanic or a millwright position. Oddly, this moves talented people from tasks that target the root cause of mechanical failure to tasks that are focused on the repair of failure. This behavior is inconsistent with management’s stated objective for machine reliability. ICML intends to raise the profile of machinery lubrication through certification, helping managers see the wisdom in assigning highly talented people, investing in their skill-set and paying them fairly for their efforts.

3.1 Why Seek ICML Certification?

Individuals, companies and the industry at large should encourage certification. A certified individual has been examined by experts in his/her field and proven to possess the skills required to carry out the tasks associated with basic aspects of lubricant analysis for machine condition monitoring. It is the mark of a professional. A certified individual can present objective evidence of his/her value and capability. Employers or prospective employers must view experience with skepticism due to subjectivity about its applicability to the job function. Certification, on the other hand, is objective. An employer needs only to compare the body of knowledge of which the individual is certified to his/her requirements to determine if a certified individual is the best fit for a position within the organization. In other words, it is easier for the ICML certified individual to prove his/her worth to the employer or prospective employer.

During the past several years, cutbacks have produced consolidation of work tasks for which managers are responsible. Managers’ (and engineers’) time is being spread increasingly thin. Often, a manager, even a technical manager, does not have time to gain expertise
in each of the job functions over which he/she is responsible, making it difficult to gauge the competency of technical staff persons. Certification by an objective, third-party organization like ICML simplifies the manager’s job. Rather than trying to get up-to-speed on lubricant analysis so he/she can hire and evaluate technicians effectively, the manager needs only to require ICML certification for an individual to work in the lubricant analyst role, or to receive compensation at a particular pay grade. In this respect, ICML becomes a valuable timesaving tool for the manager. The manager may also choose to tie promotions and/or increased compensation to achievement of higher levels of certification (or additional certifications) from ICML or other technical societies.

Certification is good for the industry at-large too. In the absence of certification, individuals may present themselves as experts in a field, even if they lack the necessary skills to effectively function in the job. Loose cannons like this can compromise the overall credibility of the entire industry. The lubricant analysis industry is presently at a critical phase in its development. We have gained the attention of managers in industries like power generation, pulp and paper, etc. They expect certification to increase the value of their staff and provide them with a way to identify potential candidates. The lubricant analysis industry is presently at a critical phase in its development. We have gained the attention of managers in industries like power generation, pulp and paper, etc. They expect certification to increase the value of their staff and provide them with a way to identify potential candidates. Certification is good for the industry at-large too. In the absence of certification, individuals may present themselves as experts in a field, even if they lack the necessary skills to effectively function in the job. Loose cannons like this can compromise the overall credibility of the entire industry. The lubricant analysis industry is presently at a critical phase in its development. We have gained the attention of managers in industries like power generation, pulp and paper, etc. They expect certification to increase the value of their staff and provide them with a way to identify potential candidates.

<table>
<thead>
<tr>
<th>Certification Type</th>
<th>Level I</th>
<th>Level II</th>
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<tbody>
<tr>
<td><strong>Machinery Lubrication Technician (MLT)</strong></td>
<td>Targets the in-plant technician responsible for day-to-day lubrication tasks, including oil changes, top-ups, greasing bearings, lubricant receiving and proper storage and care of lubricants and dispensing devices.</td>
<td>Targets in-plant technicians or engineers responsible for managing the lube team, selecting lubricants, troubleshooting abnormal lubricant performance and supporting machine design activities.</td>
</tr>
<tr>
<td><strong>Machinery Lubricant Analyst (MLA)</strong></td>
<td>Targets in-plant technicians for the day-to-day activities associated with lubricant analysis for machine condition monitoring, including sampling, sample management, performance of simple onsite tests, managing results and performing simple diagnostics.</td>
<td>Targets in-plant technicians and engineers responsible for managing the lubricant analysis function. Tasks include team management, test slate selection, setting alarms and limits, sampling system design, selection of instruments and software and advanced diagnostics.</td>
</tr>
<tr>
<td><strong>Laboratory Lubricant Analyst (LLA)</strong></td>
<td>Targets laboratory technicians who are responsible for the day-to-day activities associated with producing lubricant analysis data employed for machine condition monitoring. Tasks include performing test, reagent management, instrument calibration and SPC-based quality control.</td>
<td>Targets laboratory technicians, chemists and engineers responsible for managing lubricant analysis activities in the laboratory. Tasks might include management of lab staff, instrument and LIMS system selection, management of calibration, maintenance of laboratory certifications and diagnostic support to clients.</td>
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3.2 Certification Exam Development Process

An important role played by ICML in certifying oil analysts is the development of an examination that tests the individual’s knowledge relative to the defined body of knowledge (see Table 3 for an example body of knowledge). The examination development process is carried out by a volunteer committee selected for its expertise in lubricant analysis for machine condition monitoring.

Table 1: Summary of ICML skill competency certifications

To facilitate and expedite the process with a minimum amount of travel and meetings, the question development process is accomplished online at ICML’s Web site using its password-protected custom software. The process begins with a primary question, which is a simple question and answer extracted from the domain of knowledge that relates to the body of knowledge. The domain of knowledge is a list of readily available books from which questions must be drawn. An example of
the domain of knowledge (for the Level I MLT exam) can be seen in Table 2. The primary question may come from anyone, not just committee members. This allows for participation from numerous industry experts.

Once the primary question is approved, a committee member writes a secondary question. The secondary question is the actual examination question. Once completed, it must be approved by another committee member to be included in the 500-question test bank. Each committee member contributes 50 questions and approves another 50 questions. No single committee member may see all the questions. The 500-question bank must be proportional to the topic area allocation percentages designated in the body of knowledge.

The exam itself is produced using a special software package that randomly draws 100 questions from the question bank. The questions and the answer options within each question are randomized so each version of the exam is unique. Because the test is generated randomly from a proportionally weighted bank of questions, the tests will generally conform to the topic weighting set forth in the body of knowledge. The examination process is procedure-driven and takes significant measures to avoid compromise. Local exam proctors are selected carefully by the ICML executive assistant based on several specifications. Their area of expertise must be unrelated to lubrication, oil analysis or equipment reliability engineering.


Table 2: MLT domain of knowledge

### 3.3 Maintenance of ICML Certifications

ICML certification is valid for three years from the date of issue. Therefore, certification must be maintained using a recertification system. The purpose for recertification is to ensure that certified individuals keep their skills current and up-to-date. Recertification may be achieved by one of the following two methods:

- **Recertify by points.** Candidates must obtain sufficient recertification points and submit a completed application to ICML within six months after the expiration of certification (see Table 4 for detailed discussion of the recertification points system). You may obtain a recertification-by-points log and instruction manual online at www.lubecouncil.org, or by calling ICML at 918-451-7849.

- **Recertify by examination.** Previously certified individuals may recertify by correctly answering 70 percent of the odd or even (to be assigned by the proctor) questions on a standard certification examination.

### 3.4 Recertification Points System

An application for recertification must be received within six months after expiration of one’s certification in order to recertify by points. All points must be earned during the time the certification was in effect. Points earned before or after the certification period will not be accepted. Points may be applied to multiple ICML certifications held by the individual, assuming that the points are applicable and approved for each individual recertification.

To recertify by points, individuals must accumulate 20 recertification points over the three-year period. Appropriate documentation is required. Points may be claimed using the following criteria:
I. Maintenance Strategy (5 %)
   A. Why machines fail
   B. The impact of poor maintenance on company profits
   C. The role of effective lubrication in failure avoidance

II. Lubrication Theory (10 %)
   A. Fundamentals of tribology
   B. Functions of a lubricant
   C. Hydrodynamic lubrication (sliding friction)
   D. Elasto-hydrodynamic lubrication (rolling friction)
   E. Mixed-film lubrication

III. Lubricants (15 %)
   A. Base oils
   B. Additives and their functions
   C. Physical, chemical and performance properties and classifications of oil lubricants
   D. Grease lubrication
      1. How grease is made
      2. Thickener types
      3. Thickener compatibility
      4. Physical, chemical and performance properties and classifications of grease lubricants

IV. Lubricant Selection (15 %)
   A. Viscosity selection
   B. Base oil type selection
   C. Additive system selection
   D. Machine specific lubricant requirements
      1. Hydraulic systems
      2. Rolling element bearings
      3. Journal bearings
      4. Reciprocating engines
      5. Gearing and gearboxes
   E. Application and environment related adjustments

V. Lubricant Application (25 %)
   A. Basic calculations to determine required lubricant volume
   B. Basic calculations to determine relube and change frequencies
   C. When to select oil; when to select grease
   D. Effective use of manual delivery techniques
   E. Automatic delivery systems
      1. Automated delivery options
      a. Automated grease systems
      b. Oil mist systems
      c. Drip and wick lubricators
      2. When to employ automated lubricators
      3. Maintenance of automated lubrication systems

VI. Preventive and Predictive Maintenance (10 %)
   A. Lube routes and scheduling
   B. Oil analysis and technologies to assure lubrication effectiveness
   C. Equipment tagging and identification

VII. Lube Condition Control (10 %)
   A. Filtration and separation technologies
   B. Filter rating
   C. Filtration system design and filter selection

VIII. Lube Storage and Management (10 %)
   A. Lubricant receiving procedures
   B. Proper storage and inventory management
   C. Lube storage containers
   D. Proper storage of grease guns and other lube application devices
   E. Maintenance of automatic grease systems
   F. Health and safety assurance

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Table 3: Body of knowledge

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
<th>Maximum</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>4 points per year</td>
<td>12 points</td>
<td>Letter from employer</td>
</tr>
<tr>
<td>Training</td>
<td>1 point per day of training</td>
<td>10 points</td>
<td>Proof of attendance and a copy of the course outline</td>
</tr>
<tr>
<td>Society Affiliation</td>
<td>1 point per year per society</td>
<td>6 points</td>
<td>Proof of membership</td>
</tr>
<tr>
<td>Article Publication</td>
<td>2 points per article</td>
<td>6 points</td>
<td>Copy of article and table of contents of the book, proceedings, magazine or journal in which it was published</td>
</tr>
<tr>
<td>Conference Attendance</td>
<td>1 point per conference day</td>
<td>6 points</td>
<td>Proof of attendance (certificate or badge) and copy of program</td>
</tr>
</tbody>
</table>

Table 4: Recertification points system.
3.5 Criteria of Acceptability for recertification points

- Employment - Employment must be in a field related to machinery lubrication and/or oil analysis.

- Training - Training topics related to oil analysis, lubrication or other topics important to effective equipment maintenance and management will be accepted.

- Society Affiliation - Acceptable societies are those that relate directly to the field of lubrication and/or oil analysis, or are generally applicable. Examples of acceptable societies include American Society of Testing and Materials (ASTM), Society for Maintenance and Reliability Professionals (SMRP), Society of Tribologists and Lubrication Engineers (STLE), American Society of Mechanical Engineering (ASME), South African Institute of Tribology (SAIT), American Society for Quality (ASQ), Fluid Power Society (FPS), etc.

- Article Publication - Articles published in journals, books or proceedings should be related to a topic within the body of knowledge for oil analysis, lubrication or equipment maintenance or management. Credit is also given for authorship of relevant books. The amount of credit is evaluated on a case-by-case basis.

4 CONCLUSION

A concerted effort is required to achieve excellence in the practical aspects of machinery lubrication. The ICML is taking a leadership role in scholarship, recognition of excellence, standards development and competency assurance certification. Because success depends upon people, competency assurance a critical tool that assures organizations employ the people with the skills necessary to achieve lubrication excellence. It also serves as a mark by which organizations can define appropriate skill-sets to support hiring, promotion and compensation, and to define training programs and skills development processes.

5 REFERENCES
