



Plant Engineering & Maintenance Division

Winter 2012 Newsletter

<http://divisions.asme.org/PEMD>

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[Chairman's Corner](#)

Chair's Message – *Eric Huston*

"The new year holds promise, and a chance to make things different -- better."

As with any new beginning, the New Year holds promise and a chance to make things different - better. We can evaluate our past and consider where we find ourselves today. Then, having done so, we can propose to change. We can heal worn or damaged relationships, undertake new relationships, and determine to be more than what we have been. After all, a key to developing a lasting legacy is the difference we can make in the lives of others.

Your executive committee is responding to the New Year in much the same way you do as an individual. We are reviewing the last year and considering what we did well and what we need to improve on and then we make plans to be better. To that end, your executive committee will once again reflect on our strategic plan during the first quarter of 2012. The purpose of our strategic planning is to evaluate how to better serve you as our members, and to consider opportunities that may lie on the horizon. As we consider these things, we will begin to formulate plans to address each issue.

Of course our strategic plan is useless without execution. This is where we need your active involvement.

Please contact anyone on the executive committee if you have an interest to volunteer.
http://divisions.asme.org/PEMD/Executive_Committee.cfm

In the following pages, we have assembled a balanced set of articles we hope you will enjoy reading. By 'balanced', what I mean to describe is both the "hard" and "soft" side of plant engineering and maintenance – hard for the technical aspects, and soft for the people aspects. Our technical focus covers proper pump-to-piping alignment procedures contributed by our volunteer member, Dr. Lev Nelik. Our people focus captures an interview of vice chair Sam Black on the topic of mentoring.

We appreciate your contribution to our success this past year. I wish you peace, joy, and fulfillment in 2012.

Get the most out of your ASME membership. Get INVOLVED.

Proper Pump-to-Piping Alignment Procedure

Dr. Lev Nelik, P.E., APICS
Pumping Machinery, LLC
www.PumpingMachinery.com

Piping issues directly affect the pump's life and its performance. Bringing the pump to the pipe in one operation and expecting a good pump flange or vessel fit is a very difficult, if not impossible, task. When bringing the pipe to the pump the last spool (suction side and discharge side, each) should always be left until the pump has been leveled in place and rough aligned. The final alignment will be a "free bolt condition" and, as may sound like a surprise to some, no "come-alongs" would be needed. As an ultimate investment in common sense and proper attention to details, - your pumps will last longer, with fewer failures of seals, shafts, bearings and couplings. More equipment uptime, and less lost production, will result in significant savings in dollars, and fewer headaches. To be clear, this article is intended to support the pump OEM installation requirements, not supersede them.

The site delivery of pumping equipment affects the construction process and how the pump and piping are aligned. When delivery is late, it is critical to have certified elevation prints of the equipment available during the pipe layout design process. If delivery is early, preparations must be made for long term storage using the equipment OEM instructions. The early delivery of equipment to the site has the advantage of allowing for verification of the actual measurements.

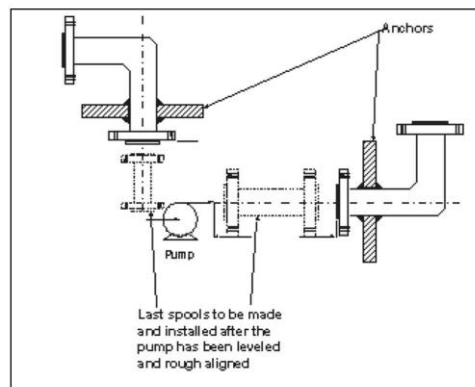


Figure 1 - Occasional usage of "anchors"

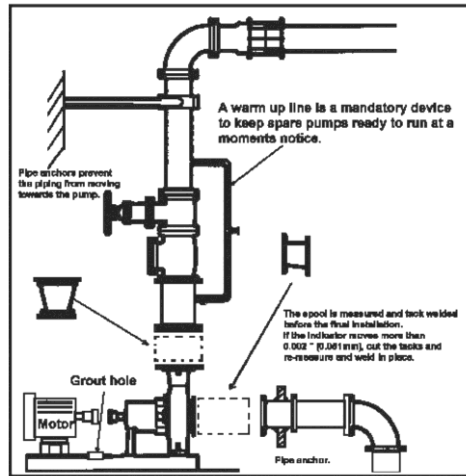


Figure 2 – Placement of Vertical Slide Pipe Support Allowing Pipe Thermal Growth

Step 1 (only for cases where there is NO thermal growth – otherwise see Step 2 discussion)

At this point the pipe should be securely anchored just before the last spool, to prevent future growth towards the pumps flanges.

The final piping layout should not be finalized until certified elevation drawings are received from the engineering group or from the pump vendor. Once the final certified prints are received the final isometrics can be completed and the piping takeoff can be done.

Step 2

Once the location of the equipment is set, the base plate can be put in place, leveled and rough-aligned, with the equipment mounted. Rough alignment of the equipment should be done prior to building the grout forms. To avoid stresses caused by thermal expansion of pipes, expansion loops should be installed in suction and discharge lines. The “sliding” pipe supports near pump suction and discharge are required to eliminate weight loads of piping on the pipe, which can cause excessive loads and misalignment, leading to seal failures, bearings, couplings, etc. However, “anchors” (three dimensional restraints) should not be used, as these could cause significant stresses and casing distortions due to thermal expansion. Consider an example of incorrectly placed anchor. The case where the pipe expands by only 30 degrees F (morning to afternoon) with a 20 in² contact area:

$$\frac{\Delta L}{L} = \alpha \Delta T = \left(6.9 \times 10^{-6} \frac{\text{in}}{\text{in-F}} \right) * 30 F = 0.0002 \frac{\text{in}}{\text{in}}$$

$$\sigma = \epsilon \frac{\Delta L}{L} = (30 \times 10^6) * 0.0002 = 6000 \text{ psi}$$

$$F = \sigma A = 6000 \text{ psi} * 20 \text{ in}^2 = 120,000 \text{ lbf}$$

It will distort the pump casing, feet, shafts, etc., causing problems (notice that this is independent of connecting pipe length). If, in addition to that, you are pumping hot product, the piping expansion problem could be so much worse. But even the daily fluctuations of ambient temperature alone could cause problems, as shown in a sample calculation above.

Step 3

Once you are satisfied with the rough alignment, remove all the equipment (pump, motor gearbox, etc) from the base plate. Level the base plate to maximum out of level of 0.025" (0.06 mm) from end to end in two planes. Use machined pads as the base for the leveling instruments. Inspect the foundation for cleanliness, and if not clean, use solvent to remove grease and oil.

Step 4

Form the base using the appropriate techniques to allow for the weight, temperature rise and fluidity of the grout material. Grout the base using epoxy grout, following the grout manufacturer's recommendations. This normally requires 24 hrs at 80° F (27°C). Remove the forms and clean all sharp residue and edges from the foundation.

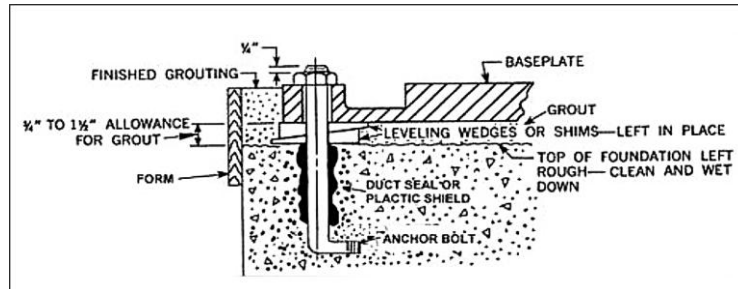


Figure 3 – Typical Anchor Bolt and Leveling Wedges

Step 5

The rough alignment step is critical to minimize the changes that will be required for final piping to pump alignment. Motor hold-down bolts are often too tight and allow only for small adjustments to the motor before becoming bolt bound. If you find yourself in a position requiring more motor placement adjustment, consider contacting the motor manufacturers for allowances to slot the motor feet.

Step 6

Reinstall the pump and the motor on the base plate. Rough align the equipment again, using reverse indicator, laser alignment or similar alignment techniques.

It should be now easy to fine-tune the motor movement within the allowable alignment target without becoming bolt bound. This is possible because of the rough alignment during the prior step (Step 4) was completed. The normal procedure is to place shims under the motor feet. This allows for adjustments that will be required during final alignment.

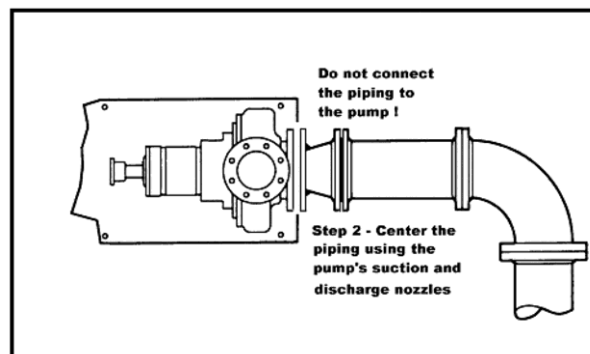


Figure 4 – Suction Pipe Connection

Step 7

Maup the final spool pieces for the suction and discharge spaces. Bring the piping to the pump now.

Warning! – “anchor” is placed erroneously - it will restrain the pipe thermally moving away from the pump free: the pipe will expand from the anchor into the pump! (see discussion in Step 2)

Step 8

As a final alignment step, bring the piping to the equipment; take final measurements, tack weld the spools in place. Leave a square and parallel gap between the flange faces. The gap should be wide enough to accommodate the size of the gasket required, plus 1/16 - 1/8”, depending on piping sizing. This is the only distance over which the piping will be pulled. However, because it is properly anchored before the spool pieces, this length is short, and stresses are minimized. Final align the equipment, taking into account hot and cold operating conditions, using two indicators on the pump shaft coupling area.

Step 9

As the piping is tightened into place, the pump shaft shall not move more than 0.002" (0.005 mm). Pump shaft alignment changes between the initial alignment and final could indicate an unwanted force from the piping system on the pump. In this case, the spool pieces should be reworked until the piping misalignment is fixed.

Step 10 – Troubleshooting

Clues of piping to component misalignment include mechanical seal and/or bearings running hot, and shorten life spans. To make a final confirmation of the symptoms, unbolt the piping while measuring the movement in the vertical and horizontal plan. Again, the piping that moves more than 0.002" (0.005 mm) must be modified to correct the situation.

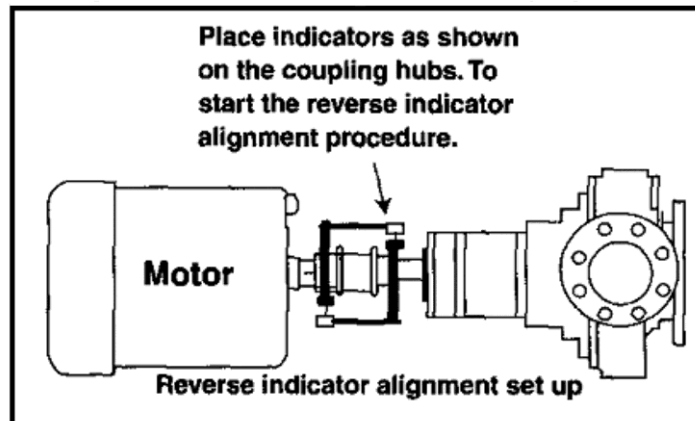


Figure 5 – Overhead view of the motor and pump

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6. Nelik L., "Centrifugal and Rotary Pumps: Fundamentals with Applications", CRC Press, Boca Raton, FL, March, 1999
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Mentoring – Interview with Sam Black

David Christiansen, PEMD Secretary

*From the Bing dictionary for **MENTOR: experienced adviser and supporter: somebody, usually older and more experienced, who advises and guides a younger, less experienced person.***

While there are numerous articles that discuss different aspects of mentoring, we decided to present the personal experiences of someone who has been both a mentor and mentee. The following interview is with Sam Black, PEMD Vice-Chairman and Operations Manager for Honeywell.

• Describe your background – both professional and with ASME?

I have a BS degree in mechanical engineering and have worked in the nuclear power, petrochemical and chemical industries. I have been an ASME member since 1986. In the industry I have worked in various roles ranging from shift operator, to engineer to plant manager. My volunteer work with ASME started as a student member and officer and has since ranged from reviewing technical papers for presentations at conferences to serving as vice-chair for the Plant Engineering and Maintenance Division.

• What is the earliest memory of being either a mentor or being mentored since starting down the path of being a mechanical engineer?

I've been fortunate enough to have a number of good mentors over the years, even if I didn't realize it at the time! During my education the mentoring was coming from professors and graduate students. It may be cliché' but much of that advice has been as applicable to life as it was to my studies at the time: "have fun, yet still get it done" sort of thinking. My early career mentoring was mostly technical in nature as I needed to marry practical experience of others with my formal engineering education: "watch, learn and improve" seemed to be a common theme. I've kept both of those threads of thinking active in my personal and professional life.

• Describe the best and worst experiences as a mentor or being mentored (lessons learned).

Life's lessons have taught me that just about everyone has something helpful they can share. In my experience, the best mentors are those who are not in a direct chain of command above you but yet have still experienced what you are going through. I think the best mentoring for me has been the more subtle efforts that started something like: "Sam have you considered . . ." "The other extreme is the direct and gruff "I've been there and done that, so you should do this"! While it might be abrasive, if one looks hard enough, and with an open mind, they are likely to find useful knowledge in there.

• As part of the ASME Mentoring program, please describe your experiences and how has this helped you both as a practicing engineer and in an ASME Leadership role.

You may not often know what impact you have on others. During the last ASME Leadership Training Conference in 2011, I was asked to mentor some early career and student members. It was refreshing to see the energy coming from these young engineers as well as their breadth of knowledge. After a few days of periodic visits and discussions, I left the conference not knowing what level of impact, if any, I may have had as their “mentor”. I received the traditional (and appreciated) respectfully thankful emails within a few days. What was even more rewarding was the email I received a couple of weeks later from one of the recently unemployed “mentees”. They had used a very specific interviewing tip I had given them during a casual dinner conversation and they reported the interviewer was openly impressed. The “mentee” felt positive that tip was a key factor to them receiving the job offer. Naturally, I felt great about the entire experience after learning that!

Technical Committee Operating Board Notes – November 12-13, Denver, Colorado

David Christiansen, PE, PEMD Secretary

I represented PEMD at the Technical Committee Operating Board (TCOB) in Denver, November 12-13, 2011. This was my first exposure to the TCOB, as such; I offer the following for your information.

- The ASME technical divisions have been reorganized this past year and as a result, the Manufacturing Technical Group (MTG) now has 5 technical divisions; Manufacturing Engineering Division (MED), Materials Handling Engineering Division (MHED), Process Industry Division (PID), Plant Engineering and Maintenance Division (PEMD), Pressure Vessels and Piping Division (PVPD) and Non-Destructive Examination Division (NDED). The various division representatives are discussing a name change for MTG that might better represent the divisions of the group.
- There is a new technical journal in process of being published. Micro & Nano Manufacturing Journal is expected to be available in January 2013. If you have a technical article for this journal, follow the submission process on the ASME Web page in the Knowledge Base section under Journals.
- Social media has been a subject of discussion in pockets of ASME. PEMD is taking the lead working with ASME staff to develop Society-level rules and guidelines for using this communication media. If you would like to be part of this process, contact David Christiansen (christiansend1@asme.org) or Greg Coil (gregory.coil@amec.com).
- A new ASME award is in process of being developed, “TCOB Globalization Medal”. This is the largest cash honorarium in ASME, \$10,000 award, and will be available in 2012. The award is to recognize the person that has worked to globalize something related to ASME. Look for email blast from ASME early 2012 for more details.
- The effectiveness of the divisions is inconsistent across ASME. There is a process being rolled out by the Committee on Division Operations and Training (CDOT) that will standardize the divisions metrics and administrative activities throughout the year. The basic model is a ‘continuous improvement’ process that is common in business. For the divisions, the continuous improvement cycle will have the following steps that are all tied back to a 3 year long term plan:
 - Annual Plan – what we want to do
 - Annual Report – what we did
 - Checklist GAP Analysis – what are the gaps between the Plan and Report
 - Feedback Action – Areas of improvement
 - Develop Action Plan – How to close the gaps
 - Division Diagnostics Checklist – do the gaps match the metrics for the division
- Strategic Planning Committee – Emergent Technologies – Call for Participation
 - Thermal Energy Storage Task Force – Subject Matter Experts Needed to Share Knowledge, Organize Sessions and Review Papers for a variety of Thermal Energy Storage technologies for the 2012 IMECE. Contact Yogi Goswami, Chair, SPC Thermal Energy Storage (goswami@usf.edu)

- **Integrated/Efficient Building Equipment and Systems Task Force** This is a key program in the DOE's Energy Efficiency and Renewable Energy (EERE) office. Subject Matter Experts Needed to Share Knowledge, Organize Sessions and Review Papers a variety of Integrated/Efficient Building Equipment and System technologies for the 2012 IMECE. Contact Professor Jorge E Gonzalez, City College of New York (Gonzalez@me.cuny.cuny.edu) or Raj Manchanda, ASME Emerging Technologies (manchandar@asme.org)

Near Term PEMD Opportunities

As part of the PEMD strategic plan, we are working to establish at least one technical committee this year. At this time, we are moving towards forming a Reliability & Condition Monitoring Technical Committee and/or Energy Efficiency & Sustainability Technical Committee. We are starting to field some interest from PEMD membership. However, to build a sustaining technical committee, more than one or two people are needed. If you think that you might be interested in being part of a technical committee, contact anyone on the PEMD Executive Committee.

In addition to the technical committee possibilities, we are considering a PEMD technical conference in 2012. At this time, the theme is not nailed down, so we need people that are interested being part of the planning and execution of a conference. Planning and executing a conference requires resources to do a variety of tasks from technical paper reviews through providing support during the conference ensuring that everyone has what they need, when they need it. If you think that you might be interested in being part of conference planning/support, contact anyone on the PEMD Executive Committee.

Upcoming Conferences for PEMD Membership Consideration

While PEMD is in revitalization mode, we are working towards participating in 2 conferences in 2012, which are described below. Additionally, we recognize that there are opportunities today that our membership can take advantage of. The following is a partial list of conferences for PEMD members to consider as a means to meet their immediate needs:

- **Joint Rail Conference (JRC) 2012** will be the major, multidisciplinary North American railroad conference encompassing all aspects of rail transportation and engineering research. The conference is a cooperative effort of the seven co-sponsoring organizations and will be held April 17-19, 2012 in Philadelphia, Pennsylvania. Papers and presentations will address railroad civil, mechanical, electrical, and systems engineering, as well as safety, planning, design, operations, maintenance, and management. The conference theme is Technology to Advance the Future of Rail Transport and will cover freight and passenger rail, encompassing commuter, regional and intercity systems.
- **The 20th Annual North American Waste-to-Energy Conference (NAWTEC20)** will take place in Portland, Maine, April 23-25, 2012. Co-sponsored by the Energy Recovery Council (ERC), the American Society of Mechanical Engineers (ASME), the Solid Waste Association of North America (SWANA), and in partnership with the Waste-to-Energy Research and Technology Council (WTERT) at Columbia University, the North American Waste-to-Energy Conference (NAWTEC) is widely recognized as the leading industry technical conference and trade show focusing on municipal waste-to-energy.
- **2012 ASME International Manufacturing Science and Engineering Conference (MSEC)** will be held June 4-8, 2012, at the University of Notre Dame, Notre Dame, Indiana. At the MSEC, you will join colleagues discussing research across a wide range of materials, processes and manufacturing systems topics.
- **2012 ASME International Mechanical Engineering Congress & Exposition (IMECE)** will be held November 9-15 in Houston, Texas. The annual ASME IMECE is a premier global conference that focuses on today's technical challenges, research updates and breakthrough innovations that are shaping the future of engineering. The Congress convenes engineers, scientists and technologists of all disciplines for the purposes of exploring solutions to global challenges and for the advancement of engineering excellence worldwide.