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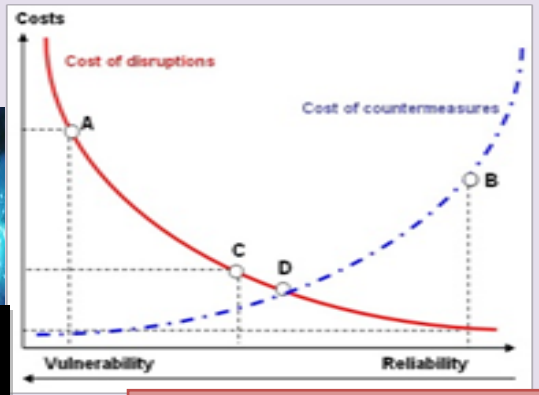
Q2 2011

21st International Conference & Exhibition

Belgrade, Serbia, 14 - 16 May 2012



I am pleased to welcome all our readers to this edition of the MEETA newsletter. Planning is well underway for the conference in November which I hope many of you will be able to attend. To minimise cost to the organisation it is being held at Engineers Ireland in Clyde Rd. in Dublin once again. The meeta Awards will be presented on the evening before the conference and we are working on having some additional attraction for early in the evening. More on that later as we finalise details. Now is the time to begin working on submissions for the Awards and we look forward to a high number of entries once again.

PAS 55 is currently being reviewed with the ultimate aim of making it a three part ISO specification. Meeta is taking an active part in this review, which is being co-ordinated by the NSAI, the National Standards Institute. The scope of this Committee and Terms of Reference are to:

Monitor & Participate in the work of ISO PC 251 in developing standards in the area of Asset Management.

Review, comment and vote on draft standards developed by ISO PC 251

Put forward a common Irish position on draft standards.

We shall keep you up to date as the situation progresses.

John Coleman (Chairman)

In this issue

A Managed Approach to Ageing Assets Can Avoid Unnecessary Capital Investment

The concept of Asset Management has been adopted by many companies in recent years as the total organisation of a physical asset's life cycle to achieve the lowest cost with maximum return. As such, it spans an entire organisation, beyond maintenance or operations functions. Asset management demands continuous, prioritised improvement through design and procedural change. Success is measured by the contribution to a company's results and shareholder value. Asset management is adapted by a growing number of enterprises as an umbrella for bringing good existing operations, maintenance, procurement, quality, and engineering practices together.

A key aspect of any world-class asset management program is a proactive, efficient work management process. A work management process is designed to ensure effective and efficient maintenance is performed on assets. Maintenance is considered as time-based and condition-based activities to restore, or know when to restore an asset. It should also take advantage of work performed by all departments and disciplines.

The current economic climate is creating a situation where many assets are being pushed to operate well beyond their planned design lives. This is happening even though some may have suffered from a lack of sustained preventative maintenance during their operation. This is a common problem, often driven by price fluctuations. When product prices are high, production requirements tend to take precedence, minimising asset care, and when price is low—maintenance is seen as a cost which can be deferred.

The trend in recent years (now reversed) towards the contracting out of design, construction, maintenance and inspection services lead to reduced common understanding by the asset owner of the sustainability issues. Inadequate training, knowledge, and experience of service providers are also factors that can reduce the effectiveness of maintenance and inspection programmes, leading a reduction in reliable asset life.

Having robust processes to help recognise and gain a good understanding of all the key issues; asset condition, appropriateness of systems, and competence of personnel is necessary to allow smart business decisions to be made, balancing the differing and sometimes conflicting requirements of production, safety and integrity, to deliver the most effective solutions. Integration of the sustainability requirements into a long term production plan is essential if the best decisions are to be implemented and the assets managed over the longer life span.

Many of the key decisions about life extensions are in fact economic, not technical. "What-if" questions such as: What if we didn't replace or refurbish this item, what would be the business impact, what would be the safety impact that needs to be considered, i.e. the cost of not doing the work. This helps to prioritise short v long term actions.

A managed and strategic approach to ageing assets can avoid unnecessary capital investment, at least in the short term, by allowing older assets to be sustained well beyond their original design lives. In addition experience shows that many equipment items are not subject to ageing related deterioration. Recognising when and where investment is required, and thereby optimising the maintenance, inspection, and replacement plans can reduce workload, and minimise the investment requirement.

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Proper lubrication plays a role in energy efficiency

Many factors come into play when selecting a lubricant, including the projected life of a gearbox, its seals, and the desired performance of the gearbox within an application.

As manufacturers continue to push the limits of machine performance to increase productivity and reduce downtime, lubricant suppliers are called upon to offer increasingly creative solutions.

Choosing the right lubricant can be an especially tricky task. Not only do industrial lubricants come in many varieties and formulations, but many industries also have their own industry regulations and standards. As a result, choosing the proper lubricant for an application is critical. Oils, greases, pastes, and waxes represent the most common categories of industrial lubricants. Typically, an oil lubricant contains 95% base oil (most often mineral oils) and 5% additives. Greases consist of lubricating base oils that are mixed with a soap to form a solid structure. Pastes contain base oils, additives, and solid lubricant particles. Finally, lubricating waxes are comprised of synthetic hydrocarbons, water, and an emulsifying agent, which becomes fluid when a certain temperature level is exceeded.

Choosing the best lubricant

The key requirement for selecting the proper lubricant is the base oil viscosity. To select the appropriate viscosity, consider the following information about your application:

- Operating speed (variable or fixed)
- Specific type of friction (e.g., sliding or rolling)
- Load and the environmental conditions
- Industry standards

For example, some lubricants, like PAG (polyalkylene glycol) oils, are good for sliding friction but are not well suited for rolling friction. Likewise, PAO short for poly-alpha-olefine, (synthesized petroleum oil), are used for rolling friction and can handle some sliding friction, whereas silicon and PFPE (perfluoropolyether) lubricants are typically used for extremely high temperatures.

Synthetics and energy efficiency

With regard to energy efficiency, some gear oils are more energy efficient than others due to their lower coefficient of friction. Polyglycols, for example, absolutely shine as the most efficient and lowest wear type of oils, particularly in high-sliding applications such as worm and hypoid gears. In these applications, PAGs offer a lower coefficient of friction within the gearbox, resulting in less power loss.

Synthetic oils are more energy efficient because they have better oxidation and thermal stability, which means the gear oil lasts much longer. One could expect to change a mineral oil every 5,000 hours, whereas PAOs or synthetic hydrocarbon oils can last approximately 15,000 hours before a change-out. In addition, PAGs can last as long as 25,000 hours at the same temperature.

As you can see, how often a manufacturer is required to change gear oil depends on the chemistry of the lubricant being used. **The 10K rule dictates that for every 10 degrees you increase the temperature of the lubricant, you halve its performance life.**

Also, remember that oxidation causes degradation of oil over time. The Total Acid number changes, and the additives are being used up. While changing the gear oil replenishes these additives and removes wear materials, it also adds maintenance downtime to the equation. Choosing a high-performance gear oil from the start will automatically reduce the amount of oxidation within the oil and decrease the required number of oil changes and downtime for equipment maintenance.

The biggest increase can be realized in gear types that are challenged in normally lower efficiencies such as worm drives. With the efficiency increases, the temperature of the gearbox drops. This decrease in temperature increases the life of the gear system. This may not sound like a big deal if you have one or two gearboxes in your plant, but if you have several gearboxes, then that energy usage adds up.

CHAIN SLING SAFETY

When using chain slings always:

- Store and handle chain slings correctly.
- Inspect chain slings and accessories before use and before placing into storage.
- Follow safe slinging practices, as given overleaf.
- Fit slings carefully, protect them from sharp edges and position hooks to face outward from the load.
- Apply the correct mode factor for the slinging arrangement.
- Back hook free legs onto the master link.

When using chain slings never:

- Attempt to shorten a sling leg other than by means of an integral chain clutch.
- Force, hammer or wedge chain slings or their fittings into position.
- Lift on the point of a hook.
- Expose chain slings to chemicals, particularly acidic conditions, without consulting the supplier.
- Use chain slings at temperatures above 200°C or below minus 40°C without consulting the supplier.
- Shock load chain slings.

Selecting the Correct Sling

Chain slings are available in a range of material grades, sizes and assemblies. Select the slings to be used and plan the lift taking the following into account:

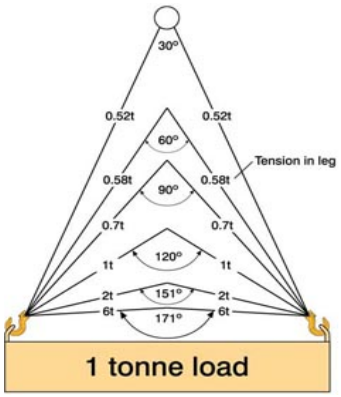
- Type of sling to be used - endless, single, two, three or four leg.
- Capacity - the sling must be both long enough and strong enough for the load and the slinging method.
- Apply the mode factor for the slinging method.
- If adjustment of the leg length is necessary select a sling with chain shortening clutches.
- For use at temperatures exceeding 200°C or below minus 40°C refer to the suppliers instructions.
- Where slings may come into contact with chemicals, particularly acids or acidic fumes, consult the supplier.**
- In the case of multi-leg slings the angle between the legs should not be less than 30° or exceed the maximum marked.
- Multi-leg slings exert a gripping force on the load which increases as the angle between the legs increases and this must be taken into account.

Using Chain Slings Safely

- Do not attempt lifting operations unless you understand the use of the equipment, the slinging procedures and the mode factors to be applied.
- Do not use defective slings or accessories.
- Do not force, hammer or wedge chain slings or fittings into position; they must fit freely. Check the correct engagement of fittings and appliances.
- Position hooks of multi-leg slings facing outward from the load. Do not lift on the point of the hook and ensure that the chain is not twisted or knotted.
- Back hook free legs to the master link to avoid lashing legs which might accidentally become engaged or otherwise become a hazard.
- Do not leave suspended loads unattended. In an emergency cordon off the area.

In-service Inspection and Maintenance

- Regularly inspect chain slings for distortion of fittings; worn, stretched, bent or twisted links; ineffective safety catches; cuts, nicks, gouges, cracks, corrosion.



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The National Maintenance and Asset Management Project Awards 2011

The awards agenda is an annual programme to recognise and honour Irish organisations and individuals that excel in performing the maintenance and asset management process to enable operational excellence. The objectives are to:

- Increase the awareness of maintenance as a competitive edge in cost, quality, service and equipment performance.
- Identify industry leaders, along with potential or future leaders, and highlight "best" practice in maintenance management.
- Share successful maintenance strategies and the benefits derived from implementation.
- Understand the need for managing change and the stages of development to achieve maintenance excellence.

Any maintenance or asset management project involving any of the following features: planning, designing, specifying, installing, modifying, operating, managing and maintenance of plant facilities, systems and equipment is eligible.

Benefits of participating:

- **Maintenance process assessment.** Applicants find that completing the application facilitates an internal audit of strengths and opportunities for improvement in maintenance and equipment reliability.
- **Competitive awareness.** Applicants find that entering the award programme increases awareness of their maintenance process and reflects favourably on their commitment to utilise maintenance as a competitive advantage for their business.
- **Goal setting.** Applying for the award helps companies establish priorities and competitive performance goals because the application is based on standards of maintenance excellence.
- **Feedback for continuous improvement,** By applying for the award, companies are provided valuable comparisons to support their continuous improvement effort.
- **Increased cooperation.** Applying for the awards builds a sense of company teamwork and emphasises the value of interfunctional cooperation.

Now is the time to begin preparations for submission.

21st International Conference & Exhibition

Belgrade, Serbia, 14 - 16 May 2012

Euromaintenance 2012 is an ambitious three day conference & exhibition on maintenance, production reliability and asset management. Euromaintenance is an initiative from the EFNMS, the European Federation of National Maintenance Societies. The 21st edition of this conference will be organised by DOTS and Sava Centar

Call for Speakers

Speaker Profile

We are looking for high profile and competent speakers who are willing to share their experience, knowledge and best practices with Maintenance Managers & Engineers from across Europe and beyond. We encourage persons with the following profiles to submit a proposal:

- Maintenance Managers
- Operations Managers
- Plant Managers
- Project Managers
- Maintenance & Reliability Engineers or Specialists
- Professors and Researchers in mentioned fields
- Consultants

Within...

- Integrating Operations & Maintenance (Lean Manufacturing, Lean Maintenance, TPM...)
- Maintenance & Asset Performance (KPI, OEE, Benchmarking, Auditing...)
- Contracting & Outsourcing Performance of Maintenance Personnel (Skills development, Knowledge Management, Safety, Health...)
- Reliability Engineering & Condition Monitoring
- Best Practices in Maintenance Execution & Planning E-maintenance (software & hardware solutions for maintenance)
- Energy Management & Environmental Improvements through maintenance
- Spare parts Management

Deadine for papers is 15th July 2011

More info at
http://www.euromaintenance.org/

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Q2 2011

Bearing Life – What makes it so short?

What do we mean by good bearing life? Most people change the bearings every time we disassemble the equipment to replace the mechanical seal or the packing sleeve. Is this really a sensible thing to do? If you think about it for a minute there is nothing in a bearing to wear out, there are no sacrificial parts.

Bearing life is determined by the number of hours it will take for the metal to "fatigue" and that is a function of the load on the bearing, the number of rotations, and the amount of lubrication that the bearing receives. Pump companies predict bearing life measured in years.

To understand the term "fatigue" we will conduct an experiment:

- Straighten out a standard paper clip.
- Flex it a little and then let it go. You will notice that it returns to the straightened position. You could repeat this cycle many times (many years actually) without breaking (fatiguing) the metal because you are cycling the metal in its "elastic range" (it has a memory similar to piece of rubber).
- Now we will bend (stress) the paper clip a lot further and you will note that it did not return to the straightened position. This time you stressed the metal in it's' "plastic range" where it did not have a memory.
- If you bend the metal back and forth in this plastic range it will crack and break in less than twenty cycles. The metal fatigued more quickly because it "work hardened" and became brittle. The more you stress the metal by flexing it the quicker it will work harden and break.
- You have just demonstrated that fatigue is a function of stress and cycles.
- When the bearing is pressed on a rotating shaft the load passes from the inner race through the balls to the bearing outer race.
- Each ball carries a portion of the stress as the balls roll under the load. It is this stress that will eventually fatigue the metal parts.

When a pump is operating at its best efficiency point (B.E.P.) the only load the bearing has to carry is:

- The weight of the rotating assembly.
- The stress caused by the interference fit on the shaft.
- Any bearing preload specified by the manufacturer.

The fact is that most bearings become overloaded because of:

- The wrong interference fit between the bearing and the shaft (the shaft was out of tolerance).
- Misalignment between the pump and its' driver.
- Bent shafts.
- An unbalanced rotating element.
- Pushing the bearing too far up a tapered sleeve.
- Operating the pump off of its best efficiency point (B.E.P.).
- Shaft radial thermal expansion.
    - Attempting to cool the bearings by cooling the bearing housing with a water hose or some other similar system. Cooling the outside diameter of a bearing causes it to shrink, increasing the interference and causing additional stress.
    - Cavitation.
    - Water hammer.
    - Axial thrust.
    - The bearing housing is sometimes out of round.
    - Pulley driven designs.
    - Vibration of almost any form.
    - The impeller is located too far away from the bearing. This is a common problem in many mixer/ agitator applications.
    - A bad bearing was supplied. This is becoming more of a problem with the increase in counterfeit parts we are finding in industry.
    - This overloading will cause heat to be generated, and heat is another common cause of premature bearing failure.
    - Heat will cause the lubricant to:
    - Decrease in viscosity, causing more heat as it loses its ability to support the load.
    - Form a "varnish" residue and then "coke" at the elevated temperature. This "coking" will destroy the ability of the grease or oil to lubricate the bearing. It will also introduce solid particles into the lubricant.
    - In addition to the heat generated by overloading we get additional heat from:
    - Level is not considered when pumps are being aligned.
    - The bearing was over greased.
- The shaft material is conducting heat from the pumped material back to the bearing housing. This is a common problem in heat transfer oil pumps, or any time a metal bellows seal is used in an application and the stuffing box cooling jacket is shut off or inoperative.
- A failed cooling jacket in the bearing housing around the stuffing box or built into the seal gland.
- Grease or lip seal contact on the shaft, right next to the bearings.

- A leading bearing manufacturer states that the life of bearing oil is directly related to heat. Non contaminated oil cannot wear out and has a useful life of about thirty years at thirty degrees centigrade. They further state that the life of the bearing oil is cut in half for each ten degree centigrade rise in temperature of the oil.

This means that oil temperature regulation is critical in any attempt to increase the useful life of anti friction bearings.

Probably the major cause of premature bearing failure is the contamination of the bearing lubrication by moisture and solids. As little as 0.002% water in the lubricant can reduce bearing life by 48%. Six percent water can reduce bearing life by 83% percent.

There are several methods used by pump companies to keep this water and moisture out of the bearing housing:

- A flinger ring to deflect packing or seal leakage away from the bearings. A silly arrangement at best.
- Keeping the bearing oil hot to prevent the forming of condensation inside the bearing case. A ridiculous system when you consider that bearing life is directly related to heat.
- The use of "so called" sealed bearings. You can call them any thing you want, but the seals will not seal anything, especially moisture or water.
- Grease or lip seals that have a useful life of about two thousand hours (84 days at 24 hours per day) and will

cut the expensive shaft directly under the seal lip. Double lip seals will cut the shaft in two places.

- Labyrinth seals that are superior to lip seals but not totally effective because you are still trying to seal with non contacting surfaces that are useless when static.

The moisture comes from multiple sources:

- Packing leakage flows back to the bearing area.
- Because of packing leakage a water hose is used to wash down the area. This washing splashes on to the pump bearing case also.
- Aspiration, moist air enters through the lip or labyrinth seals when the bearing case cools down.
- A gland that often has steam, condensate or cooling water leaking out and directed at the radial bearing.

The moisture causes several problems:

- Pitting and corrosion of the bearing races and rolling elements that will increase the fatigue of the metal components.
- Free atomic hydrogen, in the water, appears to cause hydrogen embrittlement of the bearing metal accelerating the fatigue.
- A water and oil emulsion does not provide a good lubricating film.

We get solids into the lubricant from several sources:

- Metal seal cage wear. This is the part the separates the balls that are held between the bearing races. It is often manufactured from brass or a non metallic material.
- Abrasive particles leach out of the bearing housing casting.
- Often solid particles were already contaminating the grease or oil we are using for the lubricant.

- Solids were introduced into the system during the assembly process because of a lack of cleanliness.
- Airborne particles penetrate the bearing seals.
- Particles worn off of the grease or lip seals penetrate into the bearings.

How to keep solids and moisture out of the bearing housing?

- Seal the inside of the bearing housing with epoxy or some other suitable material to stop rusting and to prevent solids from leaching out of the metal case. If you do this be careful about using some of the new high detergent lubricants. They might be powerful enough to remove this protective coating.
- Replace the grease or labyrinth seals with positive face seals. Clean the oil in the bearing casing by installing simple oil circulating and filtering system or change the oil frequently.

Many pre-packed bearing being shipped with too much or no grease at all. Always check before fitting

Calling All Maintenance people
Maintenance Survey Questionnaire

Ms. Emma Mansbridge is a master's degree engineering student carrying out research in the field of mechanical maintenance. The research being carried out requires that a number of industry professionals are contacted with a questionnaire as her project is based on a statistical analysis. The result of Project work such as this is always interesting and beneficial, hence I believe we should assist here in any way we can.

Emma has promised that she will make a copy of her findings available to all through the meeta website.

The survey has been already issued to all however Emma will be glad to supply another copy if required

I would urge all that are interested in Maintenance to complete the survey, so that it gives the best possible picture.

Thank you to all who have already completed the questionnaire.

All questions etc should be addressed directly to Emma at:- Email:

emmamansbridge@yahoo.com

or emma.mansbridge@lit.ie

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Is that Steam Trap Wasting money?

Maintenance of steam traps

Indiscriminate maintenance of steam traps costs money. Steam traps will either be:

- In good working order.
- Leaking steam.
- Blocking flow.

A major problem has always been the accurate identification of faulty traps. Poor diagnosis will allow faulty traps to remain in operation wasting energy, and perfectly good traps will be replaced unnecessarily. Accurate diagnosis is therefore important to any maintenance programme.

Routine maintenance

Routine maintenance depends on the type of trap and its application. The balanced pressure steam trap for example, has an element which is designed for easy replacement. Changing these on a regular basis, every 3-4 years, might seem wasteful, however, this practice reduces the need for trap checking and should ensure a trouble free system with minimal losses through defective traps.

Routine maintenance which involves cleaning and re-using existing internals uses just as much labour but leaves an untrustworthy steam trap. It will have to be checked from time to time and will be prone to fatigue. Any routine maintenance should include the renewal of any suspect parts, if it is to be cost effective.

Replacement of internals

The renewal of internal parts of a steam trap makes good sense. The body will generally have as long a life as the plant to which it is fitted and it is only the internal parts which wear, depending on system conditions. There are obvious advantages in replacing these internals from time to time. It depends on the ease with which the new parts can be fitted and the reliability and availability of the refurbished trap.

Testing of Steam traps

When it comes to testing steam traps, a frequently asked question is, “What is the best method?” The true answer is to use all of the technologies available today. No single test method provides the best results all of the time for the variety of steam traps in the marketplace.

Therefore, all tools available in the marketplace should be implemented and used where appropriate.

So, what are these tools? They can be generally divided into three as follows

1. Visual
2. Temperature
3. Ultrasound

Becoming proficient with these is like any task – the more often you carry out the task, the better you become. Practice and gaining the knowledge of the methods is the key to successfully using the different devices.

Visual Methods

The use of a testing-tee valve arrangement, testing-valve combination, or an inline sight glass for reviewing the steam trap discharging to the atmosphere is a very effective way of testing steam traps. This visual method can accurately determine the following conditions:

- Blow-through steam or a failed open condition
- Severe steam leakage
- Under sizing

There are negatives to any testing method and the visual method is no exception. The inspector must understand the concept of flash steam and become aware of the difference between flash steam and blow-through steam. Also, there are safety concerns due to the release of hot steam to atmosphere during the testing phase. Finally, there is a small additional cost associated with installing the components that permit online testing.

Temperature Testing Equipment

Temperature measurement equipment must be part of a steam system testing program. It is by no means the only piece of equipment that should be utilized, but can help provide information that would otherwise not be available. Understanding the limitation and capabilities of your temperature measurement equipment will only enhance its usefulness. The pressure/temperature relationship of steam makes temperature measurement extremely helpful in establishing existing steam system pressures.

Infrared testing devices will detect the temperature of the steam line ahead of the trap and at the discharge of the steam trap. The inspector must know the steam pressures before the steam trap and condensate line pressures after the steam trap to understand the steam trap performance. The inlet temperature provides insight into the saturated steam pressure at the inlet of the steam trap. The outlet temperature of the steam trap will correspond to the condensate return line pressure or back pressure existing in the condensate line.

Types of Temperature Measurement Devices

Basically, there are two types of temperature measuring devices on the market today:

- Contact
- Non-contact
- Contact Temperature Devices

Contact temperature measuring devices require time for the temperature at the point of contact to reach the same temperature as the object being tested. Depending on the surface conditions, this may not be an acceptable method of temperature measurement.

When measuring surface temperature of solid materials, the area where the readings will be taken may need some surface preparation. For instance, large

build-up of residue on a surface will cause the reading to be lower than the actual surface temperature. One other factor that may affect the accuracy of the reading will be the integrity of the contact point on the device.

Non-Contact Temperature Devices

Non-contact temperature devices measure the surface temperature of a given piece of an object utilizing radiated infrared energy. Infrared devices provide an instantaneous temperature measurement, typically without any surface preparation. However, for highly reflective surfaces, the surface should be prepared such that the infrared energy can be absorbed and detected by the instrument.

Infrared energy is sensed by optics/lenses that are sensitive to the non-visible portion of the light wave band. These types of devices provide varying degrees of accuracy depending on the following criteria:

- Quality of optics
- Spot or target diameter
- Range
- Emissivity compensation for varying surface emissivity
- Ambient temperature

Ambient temperature

The best results are obtained when a few basic concepts about infrared heat radiation are understood. All objects radiate infrared energy to some degree. The infrared thermometer has a lens that collects the radiated energy and focuses it on an infrared detector. The detector responds by producing a voltage signal, proportional to the amount of energy received. This voltage signal is correlated to a given temperature, which is displayed on a meter or LED display.

It is important to realize that not all infrared temperature measurement equipment is created equal. The main variable that affects how well a unit will work for a given application is its ability to adjust for different emissivity.

What Is Emissivity?

Some objects reflect infrared energy as well as radiate it. Shiny or highly polished surfaces will reflect more infrared energy than dull surfaces. A factor called emissivity is the ratio of radiated energy of an object compared to radiation of a black body. The higher the emissivity numbers, the smaller the portion of heat energy reflected and the more accurate the reading. Infrared sensors are accurate for emitted energy. Reflected energy requires adjustment.

Black is the optimum color that absorbs light, so we can assume that there will be no reflected infrared energy. The use of the term emissivity is an attempt to give some idea as to what portion of the infrared is reflected and how much is radiated. Emissivity will be noted as a number between 0.0 and 1.0.

Most surfaces encountered in the steam world will have an emissivity between 0.8 and 1.0. This range of emissivity has little reflected energy – no more than a one-degree difference in readings. When selecting infrared equipment, it is necessary to decide the level of accuracy needed and then purchase the equipment to suit.

Ultrasonic Testing Equipment

Ultrasonic testing equipment provides the most versatile and accurate steam system diagnostics available today. The ultrasonic unit allows the operator to hear sounds undetectable to the human ear. This type of equipment receives a high frequency signal and adjusts it so that it provides an audible sound for the operator to hear with the aid of headphones. Typical applications for performance testing include the following:

- Steam traps
- Steam leaks
- Heat exchangers
- Steam valves

Ultrasonic steam trap testing is the final test method to be used in the steam trap testing program for detecting faulty steam traps. The operator utilizes the stethoscope module to contact the discharge side of the steam trap, and has the ability to sense and detect even small changes in the steam trap operation.

The sensitivity of most high frequency monitoring equipment allows the testing person to hear not only completely failed steam traps (blowing steam), but even leaking steam from a steam trap in operation. This test method provides the earliest signal of steam trap wear and is used as a predictive tool for steam trap monitoring.

Ultrasonic testing permits the testing person to hear the internal operation of the steam trap, so the effectiveness of the steam trap operation can be determined.

Selecting Testing Procedure

Testing steam traps is simplified when the manufacturer classifies the steam traps as follows:

- On/off operation
- Continuous flow

When testing a steam trap and the testing person is not sure of the steam trap performance, then a comparison method should be used. The comparison method is accomplished by taking three individual ultrasonic readings:

- Upstream
- Discharge side of the steam trap orifice
- Downstream