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BOA
Building Operators Association of Canada

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What's Inside?

Executive & Committees

President Les Anderson	president@boacalgary.com C: 403 921 0648
Vice President Mark Arton	vice.president@boacalgary.com (c) 403-305-7029
Associate Vice President Mike Gerald	associate.vice.president@boacalgary.com 403-861-9091
Chairman Mark Arton	chairman@boacalgary.com (c) 403-305-7029
Treasurer Carrissa Speager	treasurer@boacalgary.com (c) 403-969-0329
Secretary Monika Bhandari	secretary@boacalgary.com (c) 403-470-4169
Education Committee Shaun McLean	education@boacalgary.com
Membership Committee VACANT	membership@boacalgary.com
Promotions Committee VACANT	promotions@boacalgary.com
Activities Committee Mike Gerald	Mike Gerald (c) 403-861-9091
Technical Concerns Kyle D' Agostino	technical@boacalgary.com
Webmaster Les Anderson	webmaster@boacalgary.com

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Buried Utility Locations	1 800 242 3447
City Of Calgary (All Departments)	311
Dangerous Goods Incidents	1 800 272 9600
Environmental Emergency	1 800 222 6514
Poison Centre	403 670 1414
Weather Information (24hr)	403 299 7878

President's Message

BOA
Building Operators Association of Canada
Building Operators Association
Box 22116, Bankers Hall
Calgary, AB T2P 4J5
www.boacanada.ca

I hope this message finds you and yours well and in good health

I was recently talking to a Building Operator who was having a challenging time securing a position of employment in our industry. He went on to say that the advertisements for help wanted were asking for a person to have a New Fourth-Class certificate of competency to apply for the position. He was the holder of a Building Operator A certificate and was fully qualified to operate any heating plant he was not considered, as the 4th class certificate was requested by the advertisers.

I know that the “Building Operator A” has not been taught or the certificate has not been tested by ABSA since the late 90’s. That the Certificate has been named by ABSA as “Obsolete” that can to the HR staff and job recruiters be interpreted as “no longer or less than valid” and as such they are passed by as prospective employees. Obsolete means to me as “no longer works”, not just outdated. ABSA should revisit that term.

I have taken both the Building Operator A (BOA) course as well the New Fourth course and I have to say that the people who have taken the BOA course and passed it, have a fuller understanding of Building Operations than those who have taken and passed the New Fourth Certificate of Competency. The blending of the two certificates here in Alberta has always been a sore spot with me. The 4th Class course which is an entry course Power Boilers and industry and a final certificate in Low Pressure Heating in commercial properties. Neither really serve no one well. It is too diluted for each discipline. Too much industry for Building Operations and too much Building Operations for industry. Maybe Ontario had it right when they deregulated heating plants under a certain size and allowed the industry to train and certify the staff. I have reviewed the BES courses level II and Level I out of Ontario and they are similar to the Building Operator A (BOA) and Building Operator B (BOB) respective materials. Each were focused on commercial operations and the graduates can out of the course with good, specific knowledge of their discipline. I think that and the government of Alberta, Municipal Affairs, and ABSA enforcement of regulations should get together with industry representatives such as BOMA and figure out how best to serve the industry. Oh, and they can invite BOA too. Take care, and be kind to one another.

With kind regards,

Les Anderson PE, RPA

JOIN US!

FOR OUR VIRTUAL BOA MONTHLY MEETING ON TUESDAY MARCH 9, 2021 AT 5PM

zoom

TEST YOUR OPERATOR IQ!

Are you equally adept at troubleshooting problems in the boardroom and the boiler room? As the resident facility guru, there's a lot riding on whether or not you know the difference between sounds control and a sound investment.
Try our monthly Operator IQ challenge...answers on page 17

1. Flat gauge glasses are lined with mica to:

a. prevent erosion of the glass
b. cool the glass
c. make the level easier to see
d. increase the strength of the glass
e. provide a high temperature seal

2. Flat glass water gauges are often used because:

a. it is easier to see the level
b. a light can be installed behind them
c. they are more compact
d. they are easier to clean
e. they can withstand higher pressures

3. Gauge glasses show a water level which is:

a. slightly less than the level if the vessel is at a lower temperature
b. the same if all liquids have the same temperature
c. slightly higher than boiler level when the pressure is high
d. slightly lower when the glass water density is higher
e. the actual vessel level regardless of pressure, temperature or density differences

4. How many try cocks are installed on the water column of a boiler, with over 9.3 square meters heating surface?

a. 1
b. 2
c. 3
d. 4
e. 6

5. If a gauge glass breaks, the first action by the operator should be to:

a. shut down the boiler
b. close the gage glass isolating valves
c. open the gage glass drain
d. run for help
e. reduce the feedwater flow

Water Maintenance Essential to Prevent Boiler Scaling

by Lee Doran

You can request your favorite "classic" BULLETIN article or General Meeting presentation by sending the article title or subject information via email to getinfo@nationalboard.org

Some ASME Boiler and Pressure Vessel Code requirements may have changed because of advances in material technology and/or actual experience. The reader is cautioned to refer to the latest edition and addenda of the ASME Boiler and Pressure Vessel Code for current requirements.

Former National Board Field Staff Representative and Governmental Affairs Representative

The boiler inspector is always recommending solutions to boiler plant problems discovered during inspections. A common discovery is the formation of scale on the waterside heat transfer surfaces of the boiler.

The boiler inspector usually is not a water treatment specialist. It certainly wouldn't be proper to recommend a specific treatment to correct the scaling problem, since it may not be correct and could cause more problems. Besides, the inspector cannot remain in the plant to monitor the effects of the recommended treatment.

In this regard, the proper recommendation is that the services of a reputable local water treatment firm be obtained to advise the boiler owner on the proper treatment of the scaling problem. The most common cause of overheating and failure of boiler tubes is the formation of hard scale on the boiler tube surfaces. This is caused by calcium and magnesium in the boiler water. When untreated boiler water is heated, this calcium and magnesium will precipitate from the solution to form hard scale on the tube surfaces.

In addition to the overheating and eventual failure of the boiler tubes due to scale, efficiency is also decreased in the short-term because of the scale 's insulating effect on the heat transfer surfaces. A layer of scale just 1/8 inch thick can cause as much as 20-25 percent loss in efficiency -heat lost up the boiler stack.

Besides making the above recommendations, the inspector may render further assistance to the boiler owner/operator. The inspector should inspect the boiler 's piping systems for leakage, because any leakage is unacceptable and should be a cause for concern. All water lost from the system must be replaced by the addition of untreated fresh water. This can create more problems, because fresh water brings a new supply of those scale-causing minerals. The concentration of minerals in the water is referred to as the water hardness.

Another reason that the loss of hot boiler water is serious is because it increases the humidity in the boiler room and will contribute to the malfunction and failure of electrical controls, safety devices and other electrical equipment. In addition, the loss of hot boiler water may contribute to external corrosion of metal surfaces on which the hot water is dripping. Any leakage discovered should be corrected immediately.

A good suggestion to the boiler owner/operator is the installation of a water meter in the boiler 's make-up water system. These small meters are fairly inexpensive and well worth their cost to monitor water usage, since there may be instances in which the piping is not accessible for inspection, such as underground piping. Any abnormal water usage should be thoroughly investigated. The recommendation to install a water meter in the boiler 's make-up water system is a good one, even for a boiler not

Continued on page 8...

Continued from page 7

experiencing leakage and scaling. Constant monitoring of water usage may detect otherwise unnoticeable leaking early, so corrective action may be undertaken before any damage occurs.

Another reason to monitor water usage is that high water usage will hasten scaling when the water has a high mineral concentration (hard water). It's useful to note that the level of water hardness varies throughout the United States and Canada, and depending on a boiler 's location, high water usage has been known to result in scaling within a matter of weeks.

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KenKen Puzzle

How to solve the Kenken puzzle:

(Answers on page 17)

- Fill in the numbers from 1 –6
- Do not repeat the number in any row or column
- The numbers in each heavily outlined set of squares, called cages, must combine (in any order) to produce the target number in the top corner using the mathematical operation indicated
- Cages with just one square should be filled in with the target number in the top corner
- A number can be repeated within a cage as long as it in the same or column

2	2÷		3−	5+	5−
2−		20×			
5−	3÷		1	8+	12×
		2÷	19+		
9+	3−				2
		3		7+	

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The Menace in your Basement

from ABSA "Pressure News"

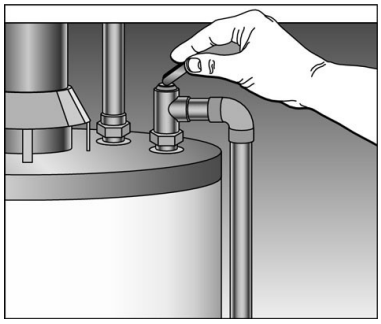
Every home has a water heater. These units are often taken for granted and neglected. Hot water heaters are in fact boilers. The burner or electrical heating element is adding energy to the water. Although a majority of water heaters are exempt from the Safety Codes Act based on their heating surface or diameter, the potential for a major accident is there because of the amount of stored energy involved.

With the recent failure of a domestic water heater, which left two people homeless but luckily unharmed, it is time to remind everyone who has a water heater that they should test the water heater's pressure relief valve (PRV). This procedure is simple and could save life!

The PRV is usually found on the side of the tank, near the top, on a gas fired water heater and on the top of the tank or in the hot water outlet on an electric water heater. About once a year, test the pressure relief valve by opening the valve manually using the lifting lever on the PRV. Ensure that no one will be scalded by the hot water released from the PRV. If the PRV does not discharge water when you open it, then the PRV must be replaced immediately. If the PRV does not re-close tightly, try opening it again to flush out any sediment. If the PRV continues to leak, it must be replaced. You must not plug the PRV and should not operate the heater with a leaking PRV for a long period of time.

If you are replacing the PRV, shut off the water to the heater and de-pressure the heater. Ensure that the replacement PRV is of the appropriate type, capacity and set pressure for the water heater. Check the manufacturer s instructions on maintenance of pressure relief valves. The PRV is for your protection. In the case of over pressure, this valve is to automatically release the pressure preventing the tank from exploding.

The manufacturer's instructions are a good source of information for safe operation, to extend the life and to maintain efficiency of your heater.



UPS: Planning for Power

by Thomas M. Divine III, P.E.

Maintaining UPS batteries properly is essential for keeping systems operating as designed and protecting facility operations

Along with the explosive growth in data-processing equipment over the last decade has come an unyielding demand for high-quality, continuous electrical power. Often, institutional, and commercial facilities meet that demand with an **uninterruptible power system (UPS).**

For an organization to obtain the maximum benefit from the investment in a UPS, maintenance and engineering managers must select an appropriate system for a facility's critical load and then maintain it to ensure it is in proper operating condition.

Battery maintenance

Only trained personnel should perform maintenance on UPS batteries, which generate voltages that are dangerous and can even be lethal. Battery racks and cabinets often provide little working space for connecting probes or tightening bolts, and unintentional contacts can easily happen. Sealed UPS batteries look similar to the more familiar and benign automobile batteries, which can make the danger easy to overlook.

The requirements of an effective battery maintenance program depend to a degree on the type of batteries that are installed.

Flooded-cell batteries, whose electrolyte is visible through the glass container, generally deliver higher performance for a greater length of time, but they have higher initial costs and advanced maintenance requirements.

Valve-regulated batteries, also known as sealed or maintenance-free batteries, have lower costs up front and require less maintenance than flooded-cell batteries. But they also have higher internal resistance and shorter life. Flooded-cell batteries can last 20 years, while the average expected lifetime of valve-regulated batteries is 7 years.

Quarterly maintenance typically includes monthly inspection items, in addition to recording the voltage readings for each cell and electrolyte temperature of selected cells. Annually, technicians should document intercell resistance readings for each cell connection and the internal resistance of each cell. Annual maintenance also involves retorquing connecting bolts and measuring the exhaust airflow with remedial action, if required. They also should perform annual maintenance procedures after a high-current discharge.

Storage batteries have limited life, usually showing a slow degradation of capacity until they reach 80 percent of their initial rating, followed by a comparatively rapid failure. The number and depth of discharge cycles, ambient temperature and charging characteristics affect battery life. The combined effect of these factors is difficult to quantify, so managers need a means to determine when a battery is near the end of its useful life in order to replace it while it still works and before the critical load is left unprotected.

An effective battery maintenance program must include regular inspections, adjustments and testing of UPS batteries, with thorough records of all readings. Trained technicians should:

- visually inspect batteries and racks monthly for signs of corrosion or leakage
- measure and record the float voltage and current of the entire bank
- note the electrolyte level in each cell
- record the voltage and electrolyte density of selected battery cells log the ambient temperature.

They also should verify that spill-containment materials are available, that emergency wash stations are operational, and that the battery-room exhaust system is functioning.

The only sure way to determine battery capacity is to perform a battery run-down test. The module is taken off line, connected to a load bank and operated at rated pow-

er until the specified run time elapses or the unit shuts down due to low battery voltage. If the observed battery capacity is 80 percent or less of its rated capacity, the technician should replace the battery.

Thermal scanning of battery connections during the battery run-down test will identify loose or marginal connections. This test is normally a manager's only opportunity to observe the battery during an extended, high-current discharge. Scanning should take place during both discharge and recharge cycles.

The optimal maintenance interval for battery run-down testing is a matter of some debate. Testing is expensive and inconvenient, requires a large load bank, and requires removing a UPS module from service and exposing the critical load to a greater hazard of interruption.

Usually, the test must be performed during off-peak hours on a weekend. Managers understandably prefer to delay or avoid this test when possible. A reasonable testing interval is every two years until the battery reaches 85 percent of rated capacity, and annually thereafter. Some experts maintain that managers can avoid this test by rigorously monitoring the internal resistance of all cells and inferring remaining capacity from those measurements.

A battery monitoring system can automate many battery maintenance tasks, including electrical measurements and record keeping. The system routinely can perform voltage, current and resistance readings and can make the data readily available to an analyst. Battery monitoring systems range in function from a simple hit counter, which records the number of discharge events, to highly sophisticated systems that continuously log electrical data and present it in graphic form. While these systems can reduce routine maintenance costs, they are quite expensive.

Managers have a variety of options with regard to battery maintenance. They can elect to perform all maintenance tasks with in-house personnel, hire outside specialists, or perform some tasks in-house while using contract personnel for less frequent or more specialized maintenance.

UPS maintenance

UPS modules are designed to provide maximum power in minimum footprint; consequently, maintenance spaces are generally cramped. UPS design varies considerably among manufacturers, and specialized knowledge is necessary to identify inspection and maintenance points within the unit.

Routine UPS maintenance consists of a variety of inspections, measurements, calibrations and preventive actions. The technician shuts down the affected module for these procedures, and remaining modules – or, in non-redundant systems, a standby generator or the local electric utility – provide power to the load until the module returns to service.

The maintenance team inspects the interior of the unit for corrosion and heat damage, records and adjusts the battery-charger float voltage, calibrates metering and protection functions, tightens power connections, cleans the module, and performs other unit-specific maintenance activities as recommended by the manufacturer. If the manufacturer's service group maintains the module, it will implement engineering change notices while the module is out of service.

During the battery run-down test, technicians should perform thermal scans on internal power connections and components to identify poor or marginal connections. Scanning should be repeated during the recharge cycle to ensure that rectifier components are adequately scanned.

Selecting a UPS and developing an effective maintenance program is a complex endeavor that requires detailed analysis, specific knowledge of available systems and equipment requirements, and a thorough understanding of facility goals and constraints. Maintenance and engineering managers can get assistance

from equipment manufacturers — especially with regard to specific maintenance requirements. Or they can engage an independent consultant to help weigh the costs and benefits of equipment selection, sizing and configuration, as well as to develop a maintenance plan that provides system reliability and longevity within the facility's budget.

FACTORS: SELECTING THE 'RIGHT' UPS

When selecting an uninterruptible power system (UPS), maintenance and engineering managers must consider the following factors that can make or break the success of the system:

1. Load size

The size of the critical load determines the capacity of the initial installation. The UPS must have adequate capacity to reliably serve the critical load and additional loads, without immediate expansion. The excess capacity of a UPS will depend on the facility's plans for expansion of the supported load.

In general, capacity should be 150-200 percent of the initial installed load. For small critical loads involving a single computer or a few racks, a single-phase desktop or rack-mounted UPS might be the optimal solution. For larger critical loads, such as data centers, freestanding three-phase modules generally are installed.

2. System reliability

System-reliability requirements will determine the configuration of the power system. Very high requirements will lead to a system with multiple UPS modules and multiple battery banks. The system also should have at least one redundant module so it can reliably serve the load if one module fails or undergoes maintenance.

A single UPS module with a static bypass switch can serve loads with lower requirements to provide utility or generator power during periods when the module is down. The consequences of a power failure tend to dictate reliability needs. If an outage would result in lost revenue, the failure to meet contractual obligations, or lost customer goodwill, it is appropriate to install a redundant system.

3. Battery run time

The battery run time of a UPS is the length of time the UPS can reliably supply power to the critical load after input power has failed. Run time usually is defined as the length of time required for connected data-processing equipment to save data files and shut down in an orderly fashion, along with a margin of safety. Typical battery run time is 15 minutes.

Batteries are heavy and can present a large dead load to a structure, so managers must make sure a structural engineer reviews the proposed installation to determine if modifications are necessary to support the load.

4. Future expansion

Requirements for future expansion affect UPS configuration and determine space requirements for future modules and battery banks. Depending on the timing of the expansion, it might be more economical to install a single module and add modules as needed, rather than installing a single, larger module.

Managers who intend to install more capacity later should consider the electrical infrastructure required to support the maximum load, and they must carefully guard spaces allocated for expansion to ensure those spaces are not filled with other equipment.

5.Budget constraints

Budgetary constraints play a key role in determining the final UPS design. Often, a system that satisfies other considerations simply will be too expensive to implement, and some functionality or system reliability will have to be sacrificed to keep costs in line.

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BEARINGS
MAINTENANCE AND REPLACEMENT

by Scott Hills

Introduction Rolling bearings are robust mechanical components which will give long service life, particularly if they are correctly mounted and well maintained. Correct handling when mounting and dismounting bearings should not present any difficulty. Cleanliness, accuracy and care are necessary, but these are not unusual requirements when dealing with machines. The maintenance of rolling bearings simply means that they should be protected from dirt and moisture and correctly lubricated. How efficiently they are protected depends on the design of the arrangement, the condition of the seals and the lubricant. Ideal lubrication means the right lubricant used correctly.

Machines are designed based on known and sometimes assumed factors regarding environmental conditions and operating requirements. Maintenance instructions must also be based on similar typical operating conditions. However, the user is well acquainted with the practical and local operating and servicing conditions. Applying this knowledge, together with the practical recommendations given in this guide regarding stocking of spares, what to look for during operation, what inspection to carry out when the machine is non-operational, dismounting and mounting, should mean that maintenance of the bearing arrangements will not present any problems.

Stocking of Replacement Bearings To avoid lengthy production stoppages caused by possible bearing failure, it is advisable to make certain that replacement bearings are readily available. It is therefore prudent to make sure at an early stage which bearings are used in the machine and whether special tools are required for dismounting or mounting. Check with the bearing representative whether the bearings can be supplied at short notice. If long delivery times exist for any of the bearings involved, it may be advisable to place an early order.

Rolling bearings are coated with a rust-inhibiting compound before being packaged and can be stored in their original package for many years. They should preferably be kept in a store where the relative humidity does not exceed 60 % and where the temperature is reasonably constant. Bearings with shields, suffix -2Z, should however not be stored for more than two years prior to use, and bearings with seals, suffix -2RS1, for not more than three years. Such bearings are "lubricated-for-life" but the grease will age and become too stiff if kept too long. Ensure that bearings not in their original package are adequately protected against dirt and corrosion.

What to look for during operation. Bearings mounted in machines where a stoppage would have serious consequences should be checked regularly. In less critical applications where they operate under less demanding conditions bearings can normally be left without attention except to see that they are well lubricated.

This section deals with routine checks and is divided into four sub-sections under the headings:

1. Listen

2. Feel

3. Look

4. Lubricate

1. Listen Place one end of a wooden listening rod, screwdriver or similar object against the bearing housing as close to the bearing as possible. Place the ear against the other end and listen. If all is well, a soft purring sound will be heard. A damaged bearing gives out a loud noise, often irregular and rumbling.

2. Feel Check the temperature of the bearing arrangement by using a thermometer, for instance an SKF digital thermometer 729117, or often simply by placing a hand on the bearing housing. If the temperature seems unusu-

4. Lubricate Relubrication the bearing arrangements according to the instructions provided by the machine manufacturer. Wipe lubricating nipples clean before fresh grease is injected. If the bearing housing is not provided with nipples, requisite relubrication should be carried out during a planned stoppage of the machine. The housing cap or end cover must be removed, the used grease taken out and fresh grease added. Even where nipples are fitted on the housing, the used grease should be removed and replaced with fresh from time to time. Check the oil level and replenish if necessary. Ensure that the air vent of the oil level gauge is not blocked. When the oil is to be changed, it is drained off and the bearing arrangement rinsed with fresh clean oil of the same type before refilling to the required level. With oil bath lubrication it is generally sufficient to change the oil once a year providing the operating temperature does not exceed +50 degrees Celsius and the oil does not become contaminated. The oil must be changed more frequently when operating temperatures are higher four times a year up to +100 degrees Celsius, monthly up to +120 degrees Celsius and weekly at +130 degrees Celsius.

Inspection when the machine is non-operational. Although rolling bearings are robust mechanical components which give long service life it is, however, wise to inspect them now and then. This can preferably be carried out during a planned stoppage of the machine or when the machine is to be dismantled for some reason, such as inspection or repair. Commence operations by arranging the working area so that it is as clean and as dry as possible. Check that replacement bearings are readily available in case they are needed. If drawings are available, they should be studied thoroughly before maintenance work is begun. Clean the external surfaces. Note the order in which the machine components are removed and also their relative positions. Care should be taken not to crack, for example, labyrinth seals as they are removed. Excessive force should never be used when removing a seal. Inspect the seals and other components of the arrangement. Check the lubricant. Impurities of various kinds can usually be felt if a little of the lubricant is rubbed between the fingers; or a thin layer may be spread on the back of the hand for inspection against the light. Ensure that dirt or moisture cannot enter the machine after the covers and seals have been removed. Cover the machine, exposed bearings and seating with waxed paper, plastic sheeting or similar material if work is interrupted. Do not use cotton waste! Wash the exposed bearing where it is possible to carry out inspection without dismounting. Use a paint brush dipped in white spirit and dry with a clean lint-free cloth or compressed air (taking care that no bearing components start rotating). Sealed bearings, however, cannot be washed and should therefore be replaced if necessary. A small mirror and probe, of the dental type, are useful when inspecting raceways, cage and rolling elements of the bearing.

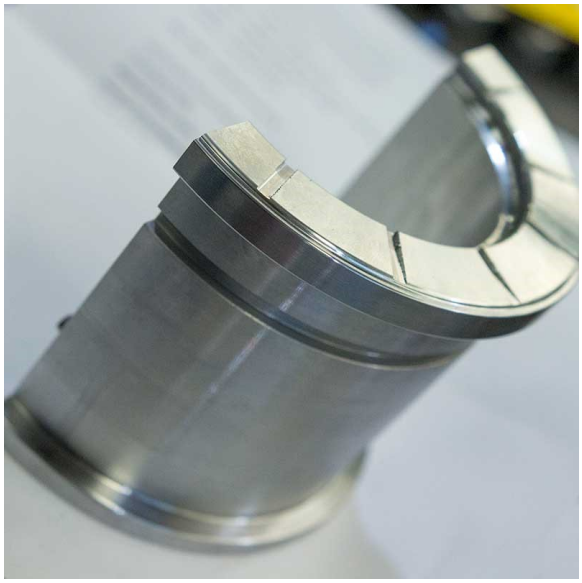
If the bearing is undamaged it should be lubricated according to the instructions provided by the machine manufacturer or to the recommendations given by your supplier before remounting. Carefully replace the seals and covers. Dismounting bearings This section contains advice and instructions on how best to dismount bearings. It is divided into sub-sections entitled as follows:

- Interference fit on the shaft
- Interference fit in the housing
- Bearings mounted on sleeves
- Inspection of dismounted bearings

Never dismount an undamaged bearing unless it is necessary!

If a bearing is to be dismounted, it is advisable to mark it to show its relative mounted position, i.e. which section of the bearing was ‘up’, which side was ‘front’ etc. The bearing should be remounted in the same position. Start dismounting by selecting the correct tools for the job - examples of suitable tools supplied by SKF

can be found on pages 50 to 55. SKF representatives will be pleased to provide additional information to cover the whole range of tools.



Remember to treat all bearings carefully. Arrange for a suitable stop or support for the shaft, otherwise the bearings may be damaged by the dismounting forces normally occurring during the operation.

If the bearing has an interference fit on the shaft, a puller should be used. This should normally engage on the inner ring face. Larger bearings may be dismounted more easily by using hydraulic tools. If it is not possible to get a purchase on the inner ring face, the puller may be applied to the outer ring face. However, it is very important that the outer ring should be rotated during dismounting to prevent any bearing component being damaged by the dismounting force. Arrange a suitable stop for the handle of the spanner for the withdrawal screw, grip the puller legs and rotate.

Use a soft metal drift with rounded point or another similar tool if there is an integral shoulder between the bearings. The inner ring assemblies of self-aligning ball bearings and spherical roller bearings can generally be swiveled so that a puller can be used. Self-aligning ball bearings and spherical roller bearings are often mounted on adapter or withdrawal sleeves.

The advantages of using a sleeve are that the shaft seating does not need such accurate machining and that mounting, and dismounting are considerably facilitated. The figure shows, from left to right, a lock nut, a locking washer, a bearing and an adapter sleeve. Adapter sleeve Dismounting is commenced after the position of the sleeve on the shaft has been marked. Then disengage the bent tab of the locking washer from the lock nut slot. Withdrawal sleeve For small and medium-size bearings, the sleeve may be removed using a similar lock nut to that used for adapter sleeves. Remember to lubricate the thread and the lock nut face adjacent to the bearing with say, molybdenum disulphide paste.

Tighten the nut using a hook or impact spanner until the bearing becomes loose. If the sleeve protrudes from the end of the shaft a suitable support must be provided. Larger bearings can easily be dismounted from their sleeves by using a hydraulic nut. Unscrew the lock nut a few turns. Place a mounting dolly or a length of tubing against the nut and apply sharp, evenly distributed blows until the bearing becomes loose. If the bearing is mounted on a smooth shaft or if there is no spacer sleeve between the bearing and the shaft shoulder, the tool should be applied to the inner ring of the bearing instead. If the sleeve is small, a soft metal drift may be used instead of a hook spanner. When the bearing has been dismounted, it should be inspected. First wash it in white spirit and then dry carefully using a clean lint-free cloth or compressed air (taking care that no bearing components start rotating). The bearing raceways and rolling elements should be inspected for any signs of damage. However, sealed or shielded bearings should not be washed on any account; for obvious reasons they cannot be inspected. Spin the outer ring and ascertain whether the bearing noise is normal. A bearing which is undamaged, i.e. has no marks or other defects on the ring raceways, rolling elements or cage, and runs evenly without abnormally large radial internal clearance, can be remounted without risk. If the bearing designation is not shown in any machine instructions, it should be recorded for future reference. The designation will usually be found on the side face of either the inner or outer ring of the bearing.

Above article was submitted by:
Scott Hills,
Technical Sales of James Electric Motor Services Ltd.

Kenken Puzzle Answer

2 **2**	2÷ **3**	**6**	3− **5**	5+ **4**	5− **1**
2− **3**	**5**	20× **4**	**2**	**1**	**6**
5− **6**	3÷ **2**	**5**	1 **1**	8+ **3**	12× **4**
1	**6**	2÷ **2**	19+ **4**	**5**	**3**
9+ **5**	3− **4**	**1**	**3**	**6**	2 **2**
4	**1**	3 **3**	**6**	7+ **2**	**5**

TEST YOUR OPERATOR IQ ANSWERS

Answers: 1) a 2) e 3) d 4) c 5) b

General Meeting Minutes

Chaired by:	Minutes by:	Call to order:	Webinar: February 9, 2021
Mark Arton	Monika Bhandari	5:01pm	

- **Introduction from Mark Arton**

Guest Speakers:
Glen Smith, VP of Eco-Growth Environmental,
Kim Caron, President of Executive Mat Group of Companies &
Mike Thompson, CleanPower Worldwide

Topic: **Alternative Waste Management Technology to Produce Biomass Energy—Presentation from site**

New Business:

- BOA Tradeshow postponed until May 2022
- More webinars to be presented possibly a few a month—share your ideas with BOA Executive
- Visit the website for YouTube videos of last meetings
- Next virtual (zoom) meeting on March 9, 2021, 5PM

JOIN US ON TUESDAY MARCH 9, 2021 AT 5PM FOR OUR VIRTUAL MONTHLY MEETING

Webinar Presentation Topic:

When & How to Maintain Gasketed Plate Heat Exchangers

This prevention will provide a wealth of knowledge for best practices with emphasis on the importance of utilizing optimal service intervals to prevent fouling and avoid unplanned heat exchanger breakdown maintenance spending.

Presenter: **Kyle D'Agostino of Heartland Exchanger**

Click on the link to register for the BOA Monthly Meeting

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