GREASING ELECTRIC MOTORS: PART 2

Howard W Penrose, Ph.D.
Vice President, Electrical Reliability Group
T-Solutions, Inc.
howard@motordoc.net

Discussion

There was a slight delay in the release of Part 2 of this series on greasing electric motors. The primary reason is that so many responses and questions came in that I felt that they should be addressed and discussed in Part 2. Therefore, we will present this paper as more of a Question and Answer, or FAQ, paper. As a result, the format will be a little different and I will present it as a series of Questions followed by the Answers.

Question: How do we measure the amount of grease recommended in the first paper?

Answer: Most lubrication, or grease, guns will provide information on the amount of grease they provide 'per pump.' Therefore, many of the tables that I have used in the past have presented the information in ml or fluid oz. The key to remember is that the tables represent a guideline for lubrication as each motor manufacturer may have slightly different dimensions for the grease housing.

Question: Why must I de-energize my motor before lubrication?

Answer: You might expect my answer to be strictly, 'for safety.' However, there are several reasons. One, of course, is safety of personnel. A majority of electric motor installations require you to approach rotating components of the machinery or motor closely, providing a dangerous condition. In the USA, OSHA has specific policies about rotating machinery and guarding, which some may have to be bypassed in order to grease the motor. Is this a real concern? Yes, later in my field service career, I had a co-worker lose an arm to a large fan while he was working on an electric motor several feet away. I have also observed objects being snatched out of the hands of maintenance personnel while working on motors (to protect the innocent, I shall remain nameless).

One way to get around this is to use a grease line from a safe location to the motor. If you do this, make sure to fill the line on initial installation so that you do not force air into the grease cavity and force out grease through any drain plugs or into the motor windings. You will also want to inspect the line to ensure that grease has not hardened within it, causing you to put bad grease into the grease housing. There is one other issue that would have to be addressed, as well. Is the machinery designed to be lubricated while it is operating? Some components and seals may act as grease pumps, moving grease into the motor and windings during greasing while the motor is operating. So, there is safety of the equipment to be considered. If you have addressed the 'pumped grease' issue with the manufacturer, grease lines are an option.

Most equipment manufacturers' maintenance instructions that I have reviewed maintain the recommendation that motors are greased while the equipment is de-energized. The primary reason: Avoiding a lawsuit. And, with that, I maintain my original recommendations.

Question: Wouldn't using a brush to remove excess grease cause contamination in the bearing housing?

Answer: Good question. Yes, it can, if not done properly or with a clean brush. The purpose for using the brush is more important, and we will address that shortly. However, one of the reasons for using a clean brush is that any parts that come from the brush will probably be the strands from the brush which can be seen and removed. Also, a brush has a tendency to 'pull' grease out with the bristles, whereas a stick or other device will drive contaminated or dry grease into the bearing.

The more important reason for using the brush is simple. You must remove hardened grease from the drain plug, otherwise you may as well leave the grease plug in place. Grease will get into the motor and will cause a pressure buildup within the housing which may damage the bearing.

Question: Are these new ultrasonic and vibration based grease guns and attachments harmful to my motor? (and variations of this question – number one question asked and a lot of literature from the manufacturers sent to me. Note: We are a submersible pump manufacturer, our bearings are greased at the factory to last the life of the equipment, so I have no need for this literature.)

Interesting, and dangerous question, but those who know me know I will answer and suffer the consequences later. This question is probably the one that I had to ponder the longest, having friends and allies at the companies that manufacture these technologies.

Each of these technologies rely upon lost energy, noise energy for ultrasonics and contact energy for vibration. When the energy loss in noise or vibration (contact) of an operating bearing increases, it means that the first stages of bearing failure are coming into play. Common practice has always been to add grease to an audibly noisy bearing to quiet it down, and these technologies are an extension of that train of thought. While a bearing is audibly noisy, it has effectively failed, one that is not yet in hearing is well on its way to failure with the energy coming from imperfections in the surfaces of the balls, cage and inner and outer rings. Adding grease until this noise is reduced means that the surfaces are being cushioned, which requires a substantial amount of the grease medium (the spongy part that holds the actual lubricant – oil) to be within the moving parts of the bearing. This causes a dampening effect of the contact energy, reducing the noise or contact vibration. As a result, you are extending the life of the bearing slightly but also causing the bearing to have to work harder by plowing through the grease (I am assuming that these devices stop you short of overly over greasing the bearings).

While I have not seen any reports from motor or bearing manufacturers showing the positive or negative results of these devices, myself, my only concern is that the greasing, by definition, must be done while the motor is operating and you must be able to get close to the rotating components to perform the greasing function. In this case, I must rely upon my previous information on greasing while equipment is operating.

Final Comments

In the next part of this series, we will cover lubrication issues specific to different bearing types and styles, including thrust and roller bearings.

There is a tremendous amount of conflicting information in the marketplace relating to bearing lubrication for rotating machinery. The question is, what do you do about it? I hope that this series assists the average maintenance layperson in the proper application and maintenance of their rotating equipment.

About the Author

Dr. Penrose joined T-Solutions, Inc in 2005 following over 20 years in the electrical equipment repair, field service and research and development fields. Starting as an electric motor repair journeyman in the US Navy, Dr. Penrose lead and developed motor system maintenance and management programs within industry for service companies, the US Department of Energy, utilities, states, and many others. Dr. Penrose taught engineering at the University of Illinois at Chicago as an Adjunct Professor of Electrical, Mechanical and Industrial Engineering as well as serving as a Senior Research Engineer at the UIC Energy Resources Center performing energy, reliability, waste stream and production industrial surveys. Dr Penrose has repaired, troubleshot, designed, installed or researched a great many technologies that have been, or will be, introduced into industry. He has coordinated US DOE and Utility projects including the industry-funded modifications to the US Department of Energy's MotorMaster Plus software in 2000 and the development of the Pacific Gas and Electric Motor System Performance Analysis Tool (PAT) project. Dr. Penrose is the Vice-Chair of the Connecticut Section IEEE (institute of electrical and electronics engineers), a past-Chair of the Chicago Section IEEE, Past Chair of the Chicago Section Chapters of the Dielectric and Electrical Insulation Society and Power Electronics Society of IEEE, is a member of the Vibration Institute, Electrical Manufacturing and Coil Winding Association, the International Maintenance Institute, NETA and MENSA. He has numerous articles, books and professional papers published in a number of industrial topics and is a US Department of Energy MotorMaster Certified Professional, as well as a trained vibration analyst, infrared analyst and motor circuit analyst.