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Here's a way to help identify the types of motor-repair operations you really want to work with.

A good vibration specification is essential in accurately identifying a good motor repair and, for that matter, a good motor-repair shop. An operation consistently able to meet a good vibration spec has proven that it has a professional staff with the proper training and the precision equipment needed to make quality repairs:

- It will have the test equipment and procedures in place for determining a scope of work resulting in a motor that meets the desired vibration specification.
- It will have a staff capable of accomplishing the required scope of work in a manner that will meet the desired vibration specification.
- And it will have test facilities capable of verifying that the motor does indeed meet the vibration acceptance criteria before leaving the shop.

The Oklahoma Gas & Electric (OGE) standard for allowable vibration on new or rebuilt Large Motors is 0.05 in. per second. The National Electrical Manufacturers Association (NEMA) standard for Medium and Large Motors with special requirements is 0.08 in. per second, (MG1-1993 rev1). (The OGE standard of 0.05 in. per second is approximately equivalent to the ISO G1.0 Balance Specification for special precision.)

By specifying 0.05 in. per second as an acceptance standard, OGE is assured a motor has been balanced to the capability of most widely available balancing machines—*and to the ability of most competent motor shops*
. Moreover, any mechanical fault or assembly error will result in a vibration level above the OGE specification. While it is extremely difficult to detect electrical faults in a motor that is operating

under no-load conditions, the OGE specification leaves very little room for any type of fault—*electrical or mechanical.*

Win/win

Since OGE began using this spec, NO motor leaving a repair shop having met the specification has been found upon commissioning to have a warrantable problem. The specification has been a win/win for both OGE and the shops:

- OGE receives a better product that lasts longer and eliminates delays during commissioning.
- The motor-repair shops have fewer motors returned for re-work.

Reality check

Experience has shown that the OGE specification is consistently achievable by well-run repair facilities with the proper equipment and a professional work force. At least two such shops exist in Oklahoma City; both have agreed to meet this spec.

Whenever either of these shops receives an OGE motor for repair, a scope of work is agreed upon *before* the work begins. If the motor is operable, a test run may be used to establish an "as received" vibration reading on the motor shop's test bed. Otherwise, the motor is disassembled and inspected for damage. A scope of work is developed to meet the OGE specification—*and an OGE representative reviews the damage and the proposed scope of work*. The scope of work is then either agreed to, or amended and agreed to.

The process works splendidly up until the point at which a motor fails the acceptance test. Then the fingers come out and the pointing begins. If the scope of work was modified, the motor shop claims it was not allowed to repair the unit properly. If, however, no scope is ever amended, cost creep occurs, and eventually the scope is seen as a blank check protecting the motor shop from any eventuality.

The reality is this: The scope of work that the motor shop and the customer agreed to—*in advance*—is complete, but the motor will not meet the also-agreed-to—*in advance*

—vibration specification. Who pays? Is it the scope or the spec that's causing the problem?

The vibration specification can't be waived after the fact. That defeats the purpose of having one. Both the scope and the spec were agreed to in advance. If the scope is changed but the specification isn't, the motor shop agrees that the new scope is sufficient to meet the specification. If the shop cannot agree that the amended scope is adequate to meet the specification, then further negotiations may resolve the issues. Otherwise, the shop can be paid for its efforts thus far to produce the scope of work and the repair can be let out for bid to competing motor-repair shops.

The original shop may also decide to bid the repair in a way and at a price it feels will meet the original spec. After all bids are evaluated, the customer can go with the lowest bidder or decide that meeting the specification is too costly. The customer might choose to replace the unit—*or just decide to accept a degraded performance at a lower cost (in which case, the vibration specification could be modified)*
. BUT whatever the decision is, it is always at the customer's discretion and agreed to in advance of any repairs.

To say that the scope of work is complete and the motor will not pass acceptance is unacceptable. Either the scope of work was insufficient to effect the proper repair or the acceptance criteria are too stringent. There is, of course, one other possibility. The scope was sufficient but improperly performed. This is the reason for the acceptance criteria in the first place—*to ensure proper repair.*

If the acceptance criteria are too stringent, is it safe to say that no motor would ever pass (or, at the least, very few motors would pass)? Actually, the opposite is true. Most motors meet or exceed the vibration specification. Very few fail. This is further evidence that not only is the specification attainable, it is an effective way to identify a defective motor.

Separating wheat from chaff

The OGE motor specification will separate merely average repair shops from operations that are above average. One intent of our specification is to identify those shops that we want to do business with. OGE needs a good, quality repair to ensure the reliability of its generation assets. Shops that are capable of consistently meeting this specification are the quality shops OGE looks for.

Admittedly, the majority of motors failing the acceptance test are typically units that are inherently more difficult to repair—*such as vertically mounted motors, two-pole motors and motors running above the first critical* . Here again, the ability to effectively repair these difficult units is what separates the average from the above-average business.

To be sure, there is always the possibility the work might be done properly, but that the test facilities are inadequate. For example, the power supply might not be capable of running the motor at full voltage, or the power supply might not be balanced across all three phases. In these cases, the ability to detect any type of electrically induced fault goes from being very difficult to impossible. On the other hand, the test bed might not be substantial enough to adequately support a motor as a rigidly mounted machine—*in which case, the motor has hardly any chance of meeting the specification*
. Even if the shop has performed a quality repair, without adequate testing facilities, there is no way of knowing the quality of the repair. (Adequate testing facilities are one more hallmark of a quality motor repair shop. Don't overlook this important element.)

Remember this

A good vibration spec will never replace an on-site inspection when identifying a quality motor-repair shop. Nor will it substitute for a certification from a standards organization such as NEMA. Over time, though, a good vibration specification CAN help your operations positively identify those shops that excel by routinely and consistently providing quality repairs (even when dealing with complex problems). These are the shops OGE seeks—*you should, too*. **MT**

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