These two processes can have a significant impact on the operational life of bearings and rotating machinery.

Excessive vibration is a major contributor to early machine failure. With shaft alignment and machinery balancing procedures in place, organizations are able to reduce that vibration and increase the life of their rotating machinery.

Research by the University of Tennessee's Maintenance and Reliability Center has shown that a 5-mil offset misalignment can reduce expected bearing life by as much as 50 percent in some cases.

Proper alignment is critical to machine life, and coupling wear or failure, bearing failures, bent rotors or crankshafts, and bearing housing damage are all common results of poor alignment. It also is known that loads on mechanical partsÑsuch as bearings, seals, and couplingsÑdecrease with improved alignment.

These reduced loads result in decreased noise and vibration, decreased operating temperatures, decreased wear on mechanical systems, and decreased downtime due to breakage.

Be aware of potential errors
Industry experts warn there are numerous potential errors that technicians can commit while performing alignment and balancing tasks.

"The plethora of alignment problems we witness are primarily due to a lack of understanding of the overall scope of alignment and related issues, improper or misuse of tools, not enough time given to do a thorough alignment job, and lack of desire to do it properly," noted John Piotrowski, Turvac Inc. "Expensive alignment systems are no substitute for an individual knowledgeable in the subject of alignment methodology."

As for balancing errors, Piotrowski said, "Balancing is usually the last thing we do to reduce vibration. We typically insure that other problems are eliminated before attempting to balance a rotor. There is nothing worse than trying to 'balance out' an alignment problem."

Other problems noted by Rich Idtensohn of Schenck Trebel Corp. are not checking for soft foot condition before performing alignment, not conducting gross alignment before fine alignment, applying the wrong tolerance for the application when balancing, and counting in the wrong direction of rotation when placing correction weights.

Several companies have seen technicians who did not properly diagnose and correct soft foot, performed improper thermal growth calculations, or did not log results to create a history of balance corrections.

Carl Eyman, Measurements, LLC, has seen technicians "assuming vibration is caused by balance just because it's at 1x rpm, and quitting an alignment job when it's 'close enough'."

Ronald J. Hemming, Maintenance Technologies International, LLC, warned against the "failure to recognize 2-plane vs 1-plane balance requirements or just not taking the time to perform a 2-plane balance and correcting to a less-acceptable tolerance using a single plane method."

"Trying to use laser alignment equipment in situations for which the dial indicator approach is better suited" was a concern of Malcolm Murray of Murray & Garig Tool Works.

A final concern was "not having balancing grade specifications when buying new rotating equipment or when sending for repair," added Guy Nollet, Proaxion Technologies." And no, new machines are not necessarily balanced to the optimum levels you would need in your plant."

Advice for avoiding errors
The consensus among most industry experts on the top advice to avoid or correct the mistakes noted earlier was non-product-specific training at regular intervals, with "proper tools, timely follow-up, or supervision to make sure the job is being done correctly," added Hemming.

Nollet echoed that view, and added that precision alignment requires "proper guidelines, training, and a strong corporate commitment that nothing else is acceptable."

Technicians should be trained and equipped in both laser and indicator approaches, noted Murray, "including criteria for making an intelligent choice of one or the other for each alignment job they encounter."

Also important is to "implement procedures that will clearly define how technicians should approach each individual piece of equipment in the plant and give them the training they need to use the balancing equipment," said Andrew J. Winzenz, Lord Corp. "Decide what information needs to be included in a balancing report and review it to ensure that proper procedures are followed and you are getting the results you need."

"Experience, experience, experience" was stressed by Larry Larson, L.P. Larson Corp. "Make sure technicians are adequately trained and supervised. The more time spent in the field, particularly in balancing situations, leads to the level of confidence that is required to make the proper decision when confronting a problem."

Programs save money

Identifying and implementing ways to eliminate misalignment and unbalance is an effective way to reduce downtime and maintenance cost. According to Nollet, an oil refinery saw its mean time between failure increase in a 5-year period from 16 months to 60 months.

The estimate from Ana Maria Delgado, Ludeca, Inc., is that a typical paper mill can expect to save "between $100,000 and $250,000 per year if starting from scratch by investing in one top laser alignment system, training at least six people to use it properly, and providing them with the necessary time and materials to do the job right. Additional savings can be expected from the implementation of proper target specifications derived from on-line monitoring of positional change."

Correction of balancing and alignment has resulted in a $500,000 savings for one customer in the food services industry, added Idtensohn. Another company reported that a sugar mill saved

$2400 per hour downtime with a laser pulley alignment tool by reducing the time to align a 10-belt drive on a sugar pulp press from 6 hours to 40 minutes. With 16 presses in the mill, annual savings (excluding labor) are projected at $204,672.

In a Texas chemical plant, the alignment of a multi-element machinery train was on the critical path of a plant turnaround repeated at 18-month intervals. Murray said by applying his "patented tooling and unpatented know-how," he reduced the alignment time from 10 days to 31/2 days. "I was told that the value of the downtime reduction was as much as $250,000 per turnaround."