

PNEUMATIC GRINDER PREVENTS WORKPLACE INJURIES IN SIMA NAVAL AMPHIBIOUS BASE CORONADO'S SMALL BOAT REPAIR DEPARTMENT

Repair technicians in the Shore Intermediate Maintenance Activity (SIMA) Small Boat Repair Shop, located on Naval Amphibious Base, Coronado, CA, work on boats from 20 to 100 feet in length, including landing craft and coastal patrol boats. The repair technicians in the Small Boat Repair Shop used a conventional electric grinder designed to have a 5-inch grinding wheel attached to it for various jobs, including the removal of corrosion from the hulls of boats and numerous other boat parts. Conventional grinders do not have an auto-balance feature, which allows the grinder to counteract the effect of uneven wearing of the grinding wheel as it is being used. Therefore, the heavy, nine-pound conventional grinder vibrated strongly. In addition, it was heavy, awkward, and fatiguing for repair technicians to use for long periods of time.



Coastal Patrol Boats are repaired in the SIMA Amphibious Base Coronado Small Boat Repair Shop

Small Boat Repair Shop employees who used the conventional grinder reported hand and arm pain, even after as little as 30 minutes of grinding. The industrial hygienist servicing the command suspected that the repair technicians reporting discomfort after using the conventional grinder were being exposed to hand/arm vibration. This type of vibration exposure is caused by the regular use of vibrating pneumatic,



Ship repair technicians reported hand and arm pain when using conventional grinders

electric, hydraulic, or gasoline-powered hand tools. Overexposures to vibration may lead to cumulative trauma disorders (CTDs) that usually involve progressive damage to the hands and arms.

The personal physician of a SIMA Small Boat Repair Shop technician who routinely used the conventional grinder diagnosed the worker with occupational vibration “white finger disease,” or Hand-Arm-Vibration-Syndrome (HAVS). HAVS is a vibration-induced disorder that leads to progressive damage to the hand’s blood vessels, as well as damage and pain in the bones, muscles, and tendons of the hands and fingers. If overexposure to vibration continues, permanent disability can result.

Several additional Small Boat Repair Shop employees who routinely used the conventional five-inch electric grinder were diagnosed with another CTD, carpal tunnel syndrome, a disorder that results in numbness, tingling, and pain in the thumb and fingers. Carpal tunnel syndrome often improves after the affected worker discontinues the work tasks that triggered the pain or discomfort and receives medical treatment.



Lightweight, *pneumatic* grinder on left produces far less vibration than heavy, conventional grinder on right

A Naval Medical Center San Diego (NMCS D) industrial hygienist performed vibration

monitoring on SIMA Small Boat Repair Shop technicians. Accelerometers were attached to grinder handles while employees used the conventional tools. The accelerometer measured the amount of vibration produced by the grinders. The vibration data collected at the Small Boat Repair Shop indicated that employees were exposed to several times the American Conference of Government Industrial Hygienists (ACGIH) guidelines for exposure to hand/arm vibration, which allows an employee to be exposed to vibration levels of 12 meters per second squared (m/s^2) for less than one hour per day. The vibration measurements also showed the industrial hygienists that the conventional grinder produced high vibration levels because of uneven wear on the grinding wheel that resulted in an unbalanced rotation.

The NMCS D Industrial Hygiene Department researched ergonomically beneficial tools for use by repair technicians at SIMA’s Small Boat Repair

Shop. Ergonomics is the science of fitting the work to the worker, instead of requiring the worker to adapt to existing working conditions.

Work tasks, equipment, and tools that are ergonomically designed help to reduce the risk of work-related injuries and disabilities. Applying ergonomic principals in the workplace increases productivity and efficiency, reduces errors, improves quality, reduces waste, increases employee retention and satisfaction, and ultimately improves work and products. In the case of the SIMA Small Boat Repair Shop, an ergonomically beneficial grinding tool would be lighter and less awkward to handle, and would minimize hand/arm vibration.



Repair technicians no longer report hand and arm pain when using ergonomically designed *pneumatic grinder*.

The Industrial Hygiene Department's research into grinding tools concluded that a *pneumatic grinder* was the best choice for SIMA's Small Boat Repair Shop, because its auto-balance feature results in far less vibration than conventional grinders. The *pneumatic grinder* has an automatic balancing design that uses ball bearings to compensate for imbalances as they develop in the grinding wheel. Such imbalances would otherwise result in vibration and vibration-related disorders. The automatic balancing technology keeps vibration levels below 5 m/s², allowing boat repair workers to use the grinders for up to six hours a day while minimizing the risk of overexposure to hand and arm vibration. An additional ergonomic advantage is that the *pneumatic grinder* is about half the size and weight of the conventional nine-pound electric grinder, making it much easier to handle and use. The time needed to complete repair projects can now be reduced as much as 25% by using the *pneumatic grinder*.

Overall, SIMA boat repair technicians are very pleased with the *pneumatic grinder* and report no discomfort when using it. Productivity in the Small Boat Repair Shop has increased for workers using the new tool, and since use of the *pneumatic grinder* was implemented there have

been no new injuries reported that could be linked to the grinding operation.

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