

GENERAL DYNAMICS

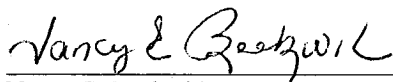
Electric Boat

SQ/08-56

November 15, 2008

Dear Valued Supplier,

1. The purpose of this letter is to notify our suppliers that it is critical that the correct heat treat requirements be specified when ordering K-Monel fasteners in accordance with Mil-S-1222H and H3. It was recently discovered that one supplier provided fasteners that were manufactured by cold forming without having the finished fastener annealed or re-annealed after cold working and prior to age hardening as required by Mil-S-1222H and H3, paragraph 3.1.2.1.
2. Mil-S-1222H and H3, paragraph 3.1.2.1 requires K-Monel (Grade 500) fasteners that are formed by cold heading, hot heading and threads formed by rolling to be annealed and age hardened after the cold heading, hot heading and thread rolling operation. Although the starting material may have been originally annealed, if the fasteners are formed by cold heading, hot heading and threads formed by rolling the finished fastener is required to be re-annealed before age hardening after the cold heading, hot heading and thread rolling operation.
3. K-Monel (Nickel-Copper-Aluminum (Grade 500)) is susceptible to hydrogen assisted cracking in seawater environments when in the vicinity of sacrificial anodes or other anodic materials. Susceptibility is primarily dependant on stresses at the thread root. These stresses are the result of applied loads, thread root hardness and the thread geometry. High stress at the thread root accelerates hydrogen entrance into the material. To reduce susceptibility to hydrogen assisted cracking, fastener specification MIL-S-1222 was modified to require K-Monel fasteners to be re-annealed after all forming and thread rolling operations for the purpose of reducing the material hardness, particularly in the threads.
4. Finished fasteners that are strictly manufactured by machining with their heads and threads formed by cutting do not have to be re-annealed and age hardened provided the starting material is annealed and age hardened.
5. Everyone is reminded to be on the lookout for test reports that do not report subsequent annealing and age hardening of the finished fastener after the cold heading, hot heading and thread rolling operation.
6. Suppliers should review their internal procedures /controls to ensure that the proper heat treatment is being specified and flowed down to the heat treater. Heat treating of Mil-S-1222H fasteners shall be in accordance with the applicable revision of QQ-N-286. It is important to note that QQ-N-286G puts restrictions on heat treat times and temperatures to retain slow strain rate testing performed by the mill as discussed in Paragraph 4.3.6. Heat treatment times and temperatures that are not considered to be equivalent in accordance with QQ-N-286G paragraph 4.3.6.1.1 will require slow strain testing to be re-performed.
7. It is strongly suggested that in addition to your normal inspection, suppliers should confirm that the proper heat treatment is being specified and performed in accordance with Mil-S-1222H. If it is found that cold formed K-Monel finished fasteners are not being annealed and age hardened after cold forming immediate corrective and preventive action are required. Should previously shipped products be affected, it is also requested that you notify your customer as soon as possible so that corrective actions can be taken.
8. Caution should be taken during contract review and material ordering that the correct heat treatment be specified and verified at receipt inspection and certification review.
9. Please share this lesson learned letter with your sub-tier suppliers that may supply K-Monel fasteners to Mil-S-1222. Any questions concerning the above can be forwarded to Gary Cabral of Electric Boat Supplier Quality at 860-433-8646 or E-mail gcabral@gdeb.com.



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