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TESTING THE ACCURACY AND REPEATABILITY OF COMMON TORQUING EQUIPMENT

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ABSTRACT

Proper torque application by tools is critical for achieving target axial loads in bolted flange joint applications. This study builds on previously published papers by investigating the accuracy and repeatability of three types of torque wrenches (manual click-type, hydraulic low-profile, and battery-powered pistol grip) commonly used in bolted flange joint assemblies. The authors conducted comprehensive testing on over 400 studs across five distinct flange configurations, utilizing Ultrasonic Bolt Measurement for precise evaluations. Our findings reveal that hydraulic torque wrenches exhibit the highest accuracy, consistently achieving target torque values within $\pm 3\%$, followed closely by manual torque wrenches, which maintained an accuracy within $\pm 5\%$. In contrast, battery-powered wrenches displayed higher variability, with inaccuracies averaging $\pm 5.5\%$. The study also highlights the significant role of operator skill in the performance of manual tools, suggesting that effective training is essential for maximizing accuracy. While hydraulic wrenches proved superior in repeatability, the faster torque application of battery-powered tools led to greater scatter in results.

Overall, this research underscores the importance of proper tool verification and selection in achieving reliable bolted joint assembly outcomes. It demonstrates that tooling can contribute to an accuracy variance of up to $\pm 38\%$ under field conditions. The data presented offers valuable insights for industry practitioners in choosing effective torque application methods.

