Attachments for Remote Tools and Equipment for Remote Operations

The Spallation Neutron Source (SNS) will be a facility with the capability of creating large quantities of neutrons for material science research. The neutrons are generated by high energy protons hitting a mercury target, releasing neutrons and high radiation. The Target Cell, a heavily shielded room for maintenance of the mercury target, contains four pairs of through-the-wall manipulators and one pair of servomanipulator arms attached to a bridge crane to perform maintenance in the Target Cell. The manipulators function best with tools modified for their grippers. Some recent Target Cell projects have been directly related to the development of attachments to everyday tools to be operated by manipulators. For example, there are three pneumatic torque wrenches used remotely in the Target Cell to torque nuts and bolts. In order for the larger torque wrench to be properly positioned for the mercury target bolts, the torque wrench must be capable of being held by the hoist hook in both horizontal and vertical directions. To solve this problem a stainless steel handling bail was attached to both ends of the wrench. Special bends are added to hold the hook in place over the center of gravity in both directions. The hoist hook, with help from the manipulator's arm, will move between both positions. The two smaller pneumatic torque wrenches require a remotely attachable reaction bar to counter the torquing force applied to a nut or bolt. The small wrenches need several reaction bars of various lengths and shapes for torquing different bolts throughout the Target Cell. Another example of a recent Target Cell project involves the mercury piping supports. The mercury pipe is held in support cradles. Some cradles are adjustable in both horizontal and vertical directions while most only in the vertical direction. All support cradles help align the pipes when being remotely replaced. The adjustments to the cradles are made by turning hex nuts on threaded rods connected to a plate that holds the pipe. Once the adjustments are completed and the pipe connected the nuts must be locked since the vibration of the mercury flowing through the pipe can slowly loosen the nuts and lower the pipe. A removable attachment was designed to be placed over the nuts. The attachment reacts against the side of the cradle keeping the pipe in the correct position. The SNS Hot Cell requires both modified tools and other adaptations for remote operations in its unique environment.

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