

# Performance



## MATTERS™

### Advanced digital actuator technologies developed by CCI for 3<sup>rd</sup> generation reactors optimize licensed/operating PWR.

CCI's advanced QuickTrak® digital actuator combined with DRAG® multi-stage control valve's low flow performance has proven to optimize Reactor Make-up Control System (RMCS/CVCS) at Diablo Canyon Nuclear Power Plant located on the central coast of California.

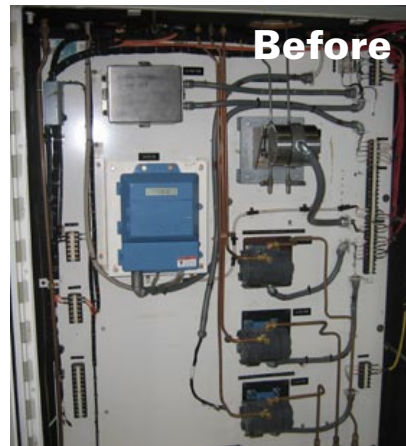
Since commercial operation was initially achieved by these Westinghouse PWRs in 1985, Reactor Operators have been challenged by accuracy limitations in the RMCS. Two conventional equal percentage control valves with diaphragm air operators were used to control chemical batching of boric acid and primary make-up water for boron dilution and reactivity adjustment (ref: tag nos. FCV 110A and FCV 111A). Control limitations with the conventional diaphragm actuated plug valves and minimum flows produced by the original system, routinely resulted in chemical overshoot of up to 10 gallons with potential for chemical shock and subsequent need for correction swings in reactor boron content. Accuracy tolerance of flow meters from that time period aggravated system response by further preventing optimum blending with de-mineralized water.

CCI radial path DRAG® control valves with 15 pressure let down stages used to replace the conventional control valves now achieve stable minimum throttling flow to 1 gpm without vibration or noise. QuickTrak®'s longer stroke and high resolution take full advantage of DRAG's® Cv characterization curve by producing small step functions in position change without hunting or overshoot and optimizes performance of the valve's 400 to 1 turn down ratio. This performance provides the capability to spread the chemical batch over longer periods of time, preventing system shock and process error.

RMCS is cycled approximately once every two hours for reactivity adjustment. DCNPP installed new



Before



Before



After



After

coriolis flow meters and closed loop programmable logic controller to further improve batching accuracy and ease operation. Informative process displays include system flow data, accumulated fluid volume delivery and PPM values. The current equipment accurately delivers a batch with an error of better than 0.05 gallons and with the boric acid concentration controlled to better than +/- 2 ppm. Precise Reactivity Control is critical for efficient reactor operation.