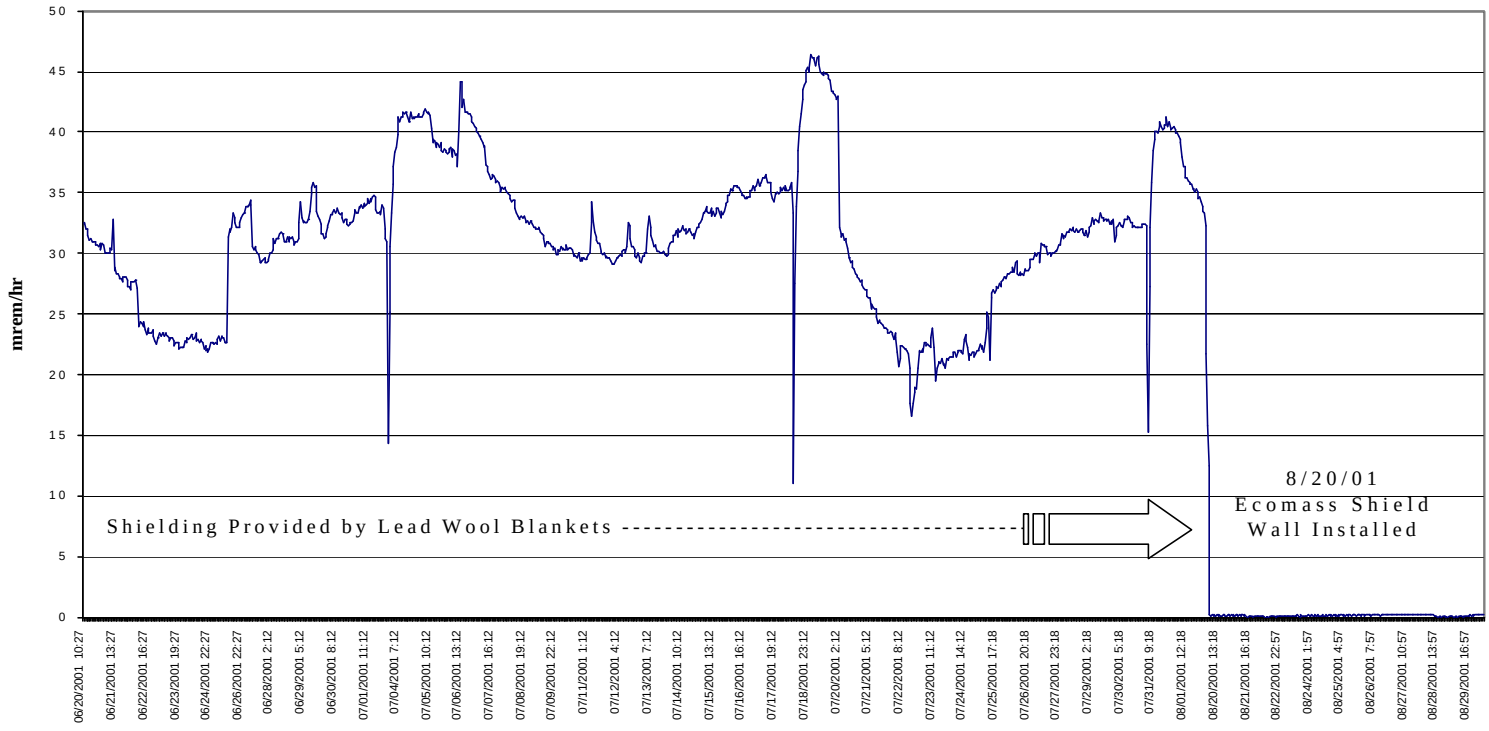
ECOMASS® PELLET-FILLED SHIELD WALL
IS A SUCCESS
AT
QUAD CITIES NUCLEAR GENERATING STATION

When Exelon Corporation's Quad Cities Nuclear Generating Plant (Cordova, IL) wanted to increase plant efficiency and output, plans were made to install an additional condensate / demineralizer (C/D) tank in Unit 2. The challenge was to properly shield the tank, which filters out cobalt, iron, and other radioactive impurities, using a minimum amount of space. Typically, a 2.5 ft. concrete wall would be used to shield a C/D tank. But in this case, less than 1 ft. was available.

Unit 2 E Condensate Demineralizer Dose Trending



The Dose Trending Graph above shows general area dose rates with six layers of lead shielding blankets installed to shield the 2E C/D tank from 6/21/2001 to 8/20/2001. The concrete block walls were being removed so workers were not receiving these dose rates unless they were required to access the areas behind the block walls. On 8/20/2001 the block wall removal was completed and the Ecomass® shield wall was installed.

While initial planning was in progress for the Unit 2 Extended Power Uprate Condensate Demineralizer Project, there was a concern about dose rates in the C/D vault after the South block wall was removed. We did not have the option of maintaining the 2E C/D tank backwash for long periods of time and there was only going to be room to install up to 6 layers of lead shield blankets. To meet the dose goals of this project we would need at least 5 inches of lead shielding to lower the dose rates to acceptable levels. 5 inches of lead shot is equivalent to 30 layers of lead blankets. To make matters worse, there would only be about 10 inches of clearance between the 2E C/D tank and the new 2H C/D air sparge ring header which would limit the thickness of the shielding that could be installed.

Rick Gero of QC Construction developed the idea of constructing a steel wall that could be installed after the South block wall was removed. The steel wall would consist of three 5.5"wide x 6'-3.5" long x 4' high sections. The total height of the wall, with the 3 sections bolt-connected, would be 12 feet. The 2E C/D tank would be backwashed for the short period of time it would take to install the wall. The wall would then be filled with lead shot to provide the necessary 5 inches of shielding.

Problem: Lead is a hazardous material that can cause health problems and would be costly to dispose of, especially if exposed to contamination which would make the lead shot a Mixed Hazardous Waste. Workers installing the lead shot would be required to wear protective clothing and respirators. Handling the lead would be similar to performing Asbestos work. If lead were used, it would take 24,780 pounds of shot to fill the wall. The shot was not available on site and a vendor only had 100 pounds available.

Solution: Use a new, nontoxic shielding material instead of lead shot. This material was Ecomass® pellets. Only 13,125 pounds of this material would be required to fill the wall and still get the same or better dose reduction as using lead shot. The vendor also had this quantity of material available for immediate delivery. Bob Thompson of QC ALARA had been to a vendor presentation of this new shielding material and immediately recognized the advantages of using Ecomass® pellets instead of lead shot to fill the wall.

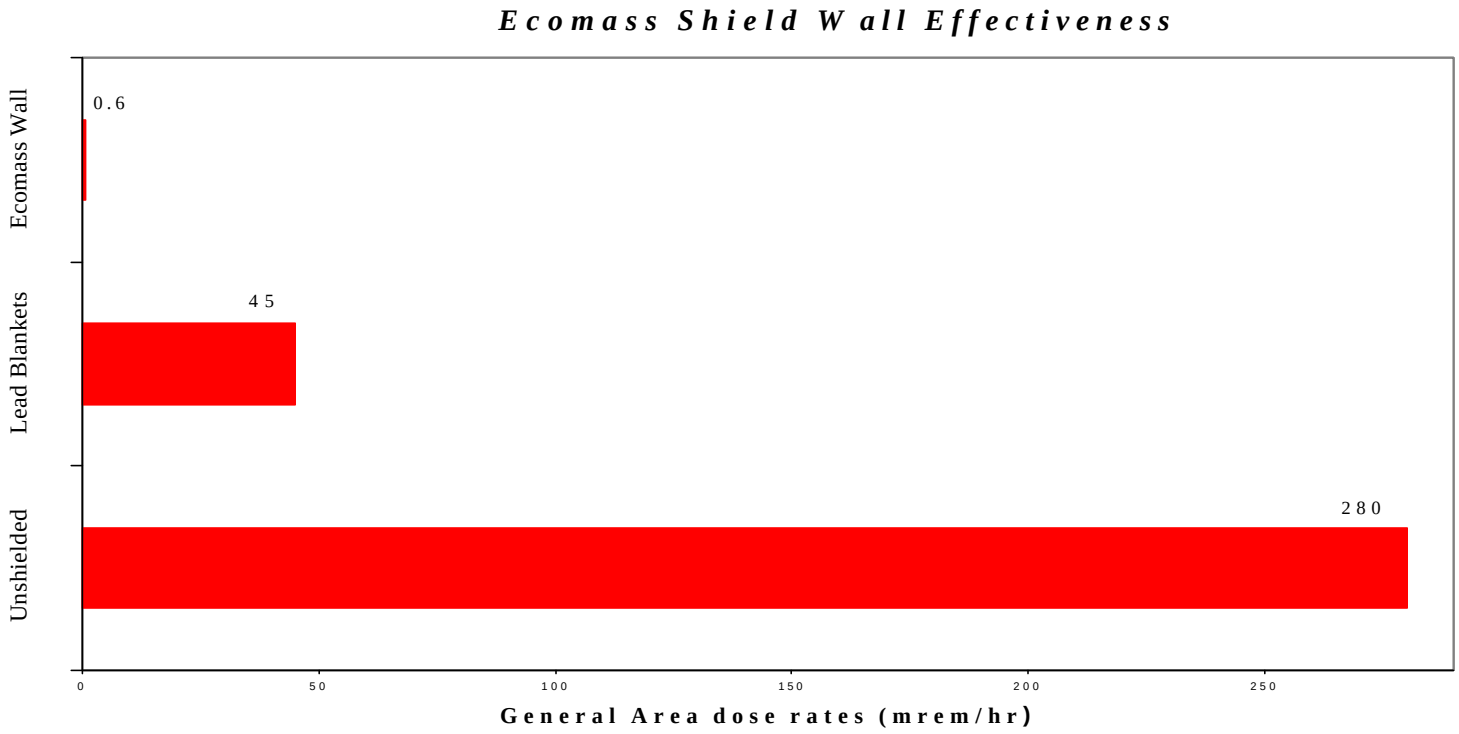
Problem: When filled with the Ecomass® pellets, the wall would weigh 13,125 lbs, or 4,526 lbs/sq ft. Live floor loading limits for this area were 350 lbs/sq ft.

Solution: Harrish Patel of QC Engineering realized that the block wall being removed weighed 47,520 pounds which is much more than the estimated weight of the Ecomass® shield wall. Working with Rick Gero he designed a wall that would contain the Ecomass® pellets and identified the requirements for installation and stability.

Robert Larkin of the QC Project Management Group approved the plan to install the Ecomass® pellet-filled shield wall. He then successfully presented this concept to QC Plant Management, procured the Ecomass® pellets and had the wall manufactured to the specifications of QC Engineering.

On 8/20/2001, the steel wall was installed and filled with Ecomass® pellets. Unit 2 was shutdown at the time for a forced outage, which reduced the dose to workers installing the wall. On 8/28/2001 Unit 2 was started up again. Surveys were taken on 08/30/2001, 09/05/2001 and 09/13/2001 as the 2E C/D tank dose rates increased. The most current survey indicates a dose rate of 180 to 280 mrem/hr between the 2E C/D tank and the shield wall and 0.6 mrem/hr on the other side of the shield wall - a 300 to 466% reduction in general area dose rate (see chart below). A 300% dose reduction was predicted for this installation.

Had the Ecomass® shield wall had not been installed, and six layers of lead shield blankets been used instead, workers in the area would have received a dose of 20 to 45 mrem/hr instead of 0.6 mrem/hr. This represents a 32 to 74 fold reduction in dose.



Conclusion: The Ecomass® shield wall installation was a success. During Q2 2002, when the final 2H C/D tank installation is completed, the shield wall will be removed and reused for the Unit 1 EPU C/D System modification.

Quad Cities is the first Nuclear Power Plant to use Ecomass® pellets for a shielding application. We are now in the process of using the pellets to construct a shielded box for TLD's being stored in the Dosimetry Building. Dresden Station, learning from our experience with Ecomass® pellets, may use this material to construct a shield for removing activated in-core components such as TIPs, SRM detectors, and IRM detectors.