

Elimination of PCB-Bearing Capacitors at the Collider Accelerator Department

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In an effort to eliminate the potential for release of PCBs, to eliminate the potential of costly waste clean-ups, and to improve accelerator reliability, the Collider-Accelerator (C-A) Department at Brookhaven National Laboratory has replaced all large PCB capacitors and 99 percent of its small PCB capacitor inventory. This paper highlights some of the key areas where the replacements took place.

The C-A Department's 200 MeV linear accelerator (LINAC) alone had 2,984 PCB-bearing capacitors containing over 1500 gallons of oil. These capacitors were all original equipment to the LINAC and were all in excess of 30 years old. The capacitors were custom made to BNL specifications, which called for a minimum 40,000 hour operating life. A conservative estimate of the operational hours logged to these capacitors at the time of removal was 180,000 hours. Although the failure rates had been low, serious consideration was given to a program to replace these aging devices to avoid failures and the significant amounts of hazardous waste that would be generated during a PCB spill clean-up.

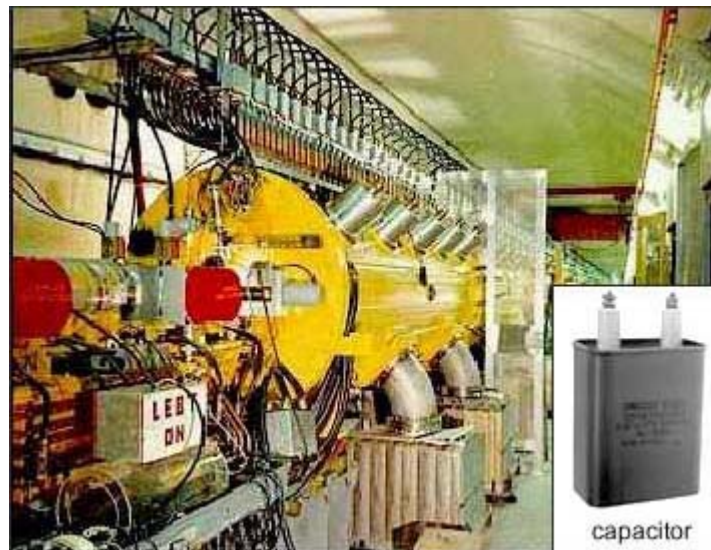


Figure 1. BNL Linear Accelerator Tunnel and Capacitor

The Siemens motor generator set in Building 928 also contained 74 large PCB-bearing capacitors. As with the large LINAC capacitors, these each hold 3.3 gallons of PCB oil. The total oil eliminated from the Siemens motor generator was 244 gallons.

Power supplies located throughout the AGS experimental floor area had small capacitors which have also been replaced. These capacitors all fell well below the reporting requirements but, never-the-less, their replacement eliminates the cost of a clean-up from a PCB spill. A total of 525 small PCB-bearing capacitors were eliminated from the AGS experimental area.

The only remaining area that contains PCB-bearing capacitors is the Tandem Van de Graaff. These capacitors are also small capacitors and fall well below the reporting requirements. There are a total of 91 capacitors and plans are being made to replace those capacitors as well.

The immediate benefit from the removal and replacement effort was to greatly reduce the potential for failures and release of PCB contaminated oils to the environment, improve accelerator reliability and reduce the maintenance overhead. The management and inspection of the inventory of large capacitors (those falling within the reporting requirements) required over 10 man-weeks per year. The Los Alamos Neutron Science Center Linear Accelerator, built during the same period as the BNL LINAC, operating similar capacitor circuits, has experienced several failures of its high power capacitors, including two explosions during operation. Understanding this, the Collider Accelerator Department took on the financial commitment to remove and replace the capacitors to avoid similar failures.

The Collider Accelerator group estimates that by implementing this PCB removal project, BNL is avoiding between \$10,000 to \$80,000 in costs per year for inspection and clean-up from potential failures. This does not include the potential significant programmatic down-time resulting from a fire due to capacitor failure.