

FILE NAME: Chlor-Alkali Asbestos Use (CAAS)

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Asbestos Exposure in Chlorine Manufacturing

Asbestos has long been used in the diaphragm-cell process for making chlorine. This process and the old mercury-cell process are still operated, although a newer and more environmentally and technically superior membrane-cell process has been the only type built anywhere in the world for the past 20 years. Some diaphragm and mercury cell plants have been converted to membrane cells. Power requirements are substantial for chlorine manufacture, and the membrane cell process requires 15-20% less energy than diaphragm cells.

Asbestos exposures in the chlorine industry arise from transport and storage of sacks of asbestos, typically involving tears in the sacks that must be identified and sealed, with spillage cleaned with high-efficiency vacuum filters. Cutting open and emptying sacks of asbestos and transferring asbestos into slurry mixing tanks can cause additional exposures. The empty sacks are an additional exposure source, they must be carefully gathered up, placed in sealed containers, and landfilled at approved sites. Storage and handling of partially used sacks are also sources of exposure. If the slurry is spilled, this has to be meticulously cleaned up right away, because once it dries it becomes a source of airborne asbestos exposure. Handling and storage of prepared or purchased pre-deposited asbestos diaphragms can cause additional exposures. Hydro-blasting for removal/replacement of asbestos diaphragms is another possible source of area contamination, drying, and airborne exposure. The water used for hydro-blasting has to be contained and the asbestos filtered from it. The waste asbestos from this water and the spent diaphragms have to go to a landfill that accepts asbestos.

To some degree, workers can be protected against these asbestos exposures if they wear respirators that will remove some of the asbestos from the air they breathe, and if they wear personal protective clothing such as disposable coveralls. But these safeguards are partial. The respirators must be fit-tested and properly maintained; and even the protective clothing is a hazardous waste that requires special precautions for disposal. Chlorine Institute pamphlet 137, *Guidelines: Asbestos Handling for the Chlor-Alkali Industry*, recommends personal protective clothing and respirators only for workers exposed in excess of the permitted limits in the OSHA standard, which is all that is legally required. But OSHA has admitted that compliance with its limits will not fully prevent deaths from asbestos. Dr. Richard Lemen and NIOSH epidemiologists estimate that exposure at OSHA's permissible exposure limit for asbestos will still cause 5 deaths from lung cancer and 2 deaths from asbestosis in every 1000 workers exposed for a working lifetime. (L. Stayner et al., *Exposure-Response Analysis of Risk of Respiratory Disease Associated with Occupational Exposure to Chrysotile Asbestos. Occ. Env. Med.* 54: 646-652, 1997).

While company manuals may state that the workers are supposed to observe various precautions to minimize asbestos exposure, there is virtually no OSHA inspection of these workplaces, and the usual combination of production demands, Gulf coast heat and humidity, and carelessness will assure that things are not always done "by the book" to minimize workers' asbestos exposure.

In the past 15-20 years, non-asbestos diaphragms have become available for relatively simple replacement in asbestos diaphragm cell plants. These are sold by Eltech/DeNora and PPG Industries in the US. The non-asbestos diaphragms cost more and last longer than asbestos. Although two-thirds of the chlorine made in the US in 2006 was from diaphragm cells, I don't know how many of these used non-asbestos diaphragms. The technology continues to advance, however, and has had wide acceptance in Europe, where the European Union's temporary exemption allowing asbestos use in chlorine manufacturing comes up for reconsideration next year. I understand that there are only 3 chlorine plants in Europe still using asbestos diaphragms.

PPG Industries has been a leader in the development of non-asbestos "Tephram" diaphragms, and PPG is also a major producer of chlorine in the US. I understand that PPG regularly replaces non-asbestos Tephram diaphragms in its asbestos diaphragm-cell units when they are taken down for periodic maintenance. I do not know of any technical reasons why other diaphragm-cell chlorine manufacturers could not do the same thing.

Therefore, if chlorine manufacturers want extra time to convert to non-asbestos technology, perhaps that could be allowed but with the requirement that when the equipment is shut down for maintenance overhauls, the new diaphragms used be non-asbestos. A similar several-year time frame might be allowed for diaphragm-cell units that manufacturers want to convert to membrane cells.

(excerpted from **Testimony of Barry Castleman, ScD, Environmental Consultant, before the U.S. Senate Committee on Environment and Public Works, June 12, 2007)**