

produces chlorine gas, and a separate decomposer produces hydrogen gas and caustic solution. There is one decomposer associated with each cell, located directly underneath the cell. The cell and the decomposer are linked at the two ends by an inlet end box and an outlet end box.

A stream of liquid mercury flows in a continuous loop between the electrolytic cell and the decomposer. The mercury enters the cell at the inlet end box and flows down a slight grade to the outlet end box. At the outlet end box, the mercury flows out of the cell and falls down to the decomposer. After being processed in the decomposer, the mercury is pumped back up to the inlet end box of the electrolytic cell.

Saturated salt brine (using either sodium chloride or potassium chloride) is fed to the electrolytic cell at the inlet end box and flows toward the outlet end box on top of the mercury stream. The brine and mercury flow under a dimensionally stable metal anode made of a titanium substrate with a metal catalyst. The mercury forms the cathode of the cell.

An electric current is applied between the anode and the mercury cathode. The electric current causes a reaction producing chlorine gas at the anode and a mercury:sodium (HgNa) or mercury:potassium (HgK) amalgam at the cathode. Chlorine is collected at the top of the cell. The amalgam ultimately exits at the outlet end box, falling into the decomposer. Depleted brine also exits the cell at the outlet end box. This brine is generally piped to a tank for resaturation and reuse.

The decomposer is a packed bed reactor where the mercury amalgam is contacted with deionized water in the presence of a catalyst. The amalgam reacts with the water, regenerating elemental mercury and producing caustic (NaOH or KOH) and hydrogen. The caustic and mercury are separated in a trap at the end of the decomposer. The caustic and hydrogen are transferred to auxiliary processes for purification, and the mercury is recycled back to the cell.

Chlorine is collected from the tops of the mercury cells by a common header system which runs through the cell building. Hydrogen is collected from the amalgam decomposers in a common header system. The hydrogen stream contains a small amount of mercury vapor from the liquid mercury processed in the decomposer. To remove the mercury vapor, the hydrogen stream is typically cooled, passed through a mist eliminator, and usually sent to a finishing device such as a carbon adsorber. The hydrogen may

then be discharged to the atmosphere, used on-site, or sold for use off-site.

In a mercury cell process, a 50 percent caustic solution is obtained directly from the amalgam decomposers. Thus, the mercury cell caustic requires little further processing to yield a commercial product.

Contaminated mercury and mercury-containing wastes are generated from a number of sources at a mercury cell plant. These include the hydrogen treatment operation, the brine and caustic treatment operations, and mercury leaks or spills. Many plants recover mercury from these wastes on-site in a mercury retort, or mercury thermal recovery unit.

Mercury is emitted from two point sources associated with the production of chlorine—the end box ventilation system and by-product hydrogen system. Mercury is also emitted from mercury thermal recovery units, which is also a point source. In addition, there are mercury fugitive emissions from the cell rooms and from the waste recovery areas.

In addition to mercury, chlorine and HCl are emitted from mercury cell plants. Chlorine can be emitted from the tail gas stream from the final liquefier, the cell room, and equipment in chlorine service. Hydrochloric acid is used to pretreat feed brine prior to entering a chlor-alkali cell, and at other locations throughout the process to adjust pH. It can also be emitted from storage tanks and equipment in HCl service.

#### *G. How Does This Action Relate to the 40 CFR Part 61 Mercury NESHAP?*

We promulgated the National Emission Standard for Mercury on April 6, 1973 (40 CFR part 61, subpart E).<sup>1</sup> Those standards (hereafter referred to as the Mercury NESHAP) limit mercury emissions from mercury cell chlor-alkali plants as well as mercury ore processing facilities and sludge incineration and drying plants. Specifically, the Mercury NESHAP limit mercury emissions from mercury cell chlor-alkali plants to 2.3 kilogram (kg) (5.1 pound (lb)) of mercury per 24-hour period and requires that mercury emissions be measured (in a one-time test) from hydrogen streams, end box ventilation systems, and the cell room ventilation system. As an alternative to measuring ventilation emissions from the cell room to demonstrate compliance, the Mercury

NESHAP allow an owner or operator to assume a cell room ventilation emission value of 1.3 kg (2.9 lb) per day of mercury providing the owner/operator adheres to a suite of approved design, maintenance and housekeeping practices. Every mercury cell chlor-alkali plant currently in operation in the United States complies with the cell room ventilation provisions by carrying out these practices rather than by measuring mercury emissions discharged from the cell room. Since every plant uses the 1.3 kg per day assumed value for its cell room ventilation emissions, subtracting the 1.3 kg per day cell room value from the 2.3 kg per 24-hour period plantwide standard effectively creates an emission limit for the combined emissions from hydrogen streams and end box ventilation systems of 1.0 kg per day (1,000 grams per day).

The requirements in today's final standards are more stringent than the requirements in the Mercury NESHAP. Using the 1,000 grams per day value as the baseline, we estimate that mercury emissions will be reduced to less than 60 grams per day (on average) by the final rule. This represents about 94 percent reduction from the Mercury NESHAP baseline for vents. In addition, the work practice standards in today's final rule represent the most explicit compilation of practices currently employed by the industry, along with detailed recordkeeping and reporting requirements. While we cannot quantify the mercury emissions reductions that would be achieved by the final work practice standards, we are confident that their implementation would result in additional reductions in mercury emissions beyond that currently achieved by the existing Mercury NESHAP.

Every aspect of the Mercury NESHAP that applies to mercury cell chlor-alkali plants is addressed in today's final rule (40 CFR part 63, subpart IIII). In fact, as discussed above, the requirements are more stringent than the respective requirements in the Mercury NESHAP. Consequently, when mercury cell chlor-alkali plants are required to comply with the final rule, the requirements of the Mercury NESHAP that apply to them will no longer be relevant or applicable. Therefore, upon the compliance date as indicated in § 63.8186 of the final rule, mercury cell chlor-alkali plants will no longer have any obligation to comply with the Mercury NESHAP, nor will they be allowed to comply with the Mercury NESHAP instead of the applicable provisions in 40 CFR part 63, subpart IIII. Specifically, affected sources

<sup>1</sup> This regulatory program was originally set forth at 38 FR 8826; April 6, 1973; and amended at 40 FR 48302, October 14, 1975; 47 FR 24704, June 8, 1982; 49 FR 35770, September 12, 1984; 50 FR 46294, November 7, 1985; 52 FR 8726, March 19, 1987; and 53 FR 36972, September 23, 1988.