



Fact Sheet

Delaware City Refinery Needlessly Killing Fish of the Delaware River

According to section 316(b) of the Clean Water Act (CWA), the Delaware City Refinery's CWA Permit, known as a NPDES Permit, must ensure "that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." For facilities such as the Delaware City Refinery (which has a cooling water intake structure) this means reducing their impingement and entrainment fish kills.

According to a 2011 Best Technology Available (BTA) Determination crafted by the Delaware Department of Natural Resources and Environmental Control (DNREC), in order for the Refinery to meet the requirements of 316(b) it must install a closed-cycle cooling system or achieve the same level of fish kill reductions as such a system would achieve. That means, the Refinery must install a system that would reduce its cooling water intake by 90%, reducing it to 45.2 mgd; or it must reduce the impingement and entrainment mortalities caused by the facility's cooling water intake structure by 90%. And after review, DNREC specifically determined that installing such technology at the Refinery was both affordable and achievable. It will cost the Refinery approximately \$75 million, a mere 6.8 cents per barrel of crude oil refined at the facility.

What is Impingement and Entrainment?

Entrainment occurs when organisms are drawn through a cooling water intake structure into the facility's cooling system. Organisms that become entrained are generally relatively small forms of fish and shellfish species. As entrained organisms pass through a plant's cooling system they are subject to mechanical, thermal, and toxic stress. The mortality rate of entrained organisms is high.

Impingement occurs when organisms are trapped against screening devices by the force of the water passing through the cooling water intake structure. Impingement can result in starvation and exhaustion, asphyxiation and descaling.

In either case, a substantial number of the organisms that are impinged or entrained are killed or subjected to significant harm as a result.



Modifying the cooling water intake system at the Delaware City Refinery could also help the facility avoid the multitude of shut downs it has experienced each year due to problems associated with its current system.

The Refinery has been allowed to evade complying with section 316(b) of the Clean Water Act because it has been allowed by DNREC to operate under an old permit that expired August 31, 2002.

The Refinery draws in up to 452 million gallons per day (mgd) of Delaware River water, pulls it through a once through cooling system, and discharges it back into the River at a heated temperature of 110⁰ Fahrenheit.

In an analysis that considered just 4 Representative Important Species, as a result of that 452 million gallons per day, the Refinery kills, through impingement and entrainment, over 45 million organisms (specifically 45,459,568). The species considered were Striped Bass, White Perch, Bay Anchovy and Weakfish. While only 4 species were counted for this study, 47 different species had been identified as being caught by the cooling water intake structure. (DNREC BTA Determination, Draft, June 8, 2011)

When viewed in conjunction with the fish kills at the Salem Nuclear Generating Station which also has a once through cooling system operating on the Delaware River (but on the New Jersey side of the Estuary), the Delaware City Refinery and Salem together kill 56% of the Striped Bass in the Delaware River. (*DNREC BTA Determination, Draft, June 8, 2011*)

In a report commissioned by the Refinery it was estimated that in 1998, 19% of the anchovy in the Delaware River and Bay stock were killed by the Refinery.

In addition to operating under a Clean Water Act permit that expired 11 years ago (in 2002), the Delaware City Refinery is operating with the same intake configuration it began with in 1957 when the facility first started up.

One reason why this facility is particularly deadly to fish is because its intake structure, including screens, are at the end of a channel that is 4,673 feet from the Delaware River and so fish that are filtered out of the water before entering the Refinery cooling system and are placed back in the water have to swim 4,362 feet (0.82 miles) in order to make it back to the River and safety. To accomplish this feat, the already screen-impacted fish, or those trying bravely to avoid getting smashed on the screen, have to swim against the velocity of water rushing towards the facility. For many, this is not a swim to safety, but a futile effort which results in their being repeatedly impinged upon the intake screen until they die. When the intake channel fills in with sediment, as it does over the course of months, the flow channel for the water becomes more confined, forcing the velocity of the water rushing towards the plant, the velocity the fish must swim against, to become even greater, making the opportunity of escape even less likely. The flow velocity of the channel when just dredged is 0.5 feet/second. If the intake screens of the facility were located on the banks of the Delaware River, at this flow velocity, escape for some would be more possible. But the 0.82 mile journey, coupled with that velocity, or greater velocities resulting from siltation, makes the possibility of escape low for even an un-impinged fish, let alone one who has already been damaged by impingement and return.