JS | HELD

PERSPECTIVES

The Clean Water Act & Environmental Regulatory Compliance: A Strategic Approach to the Final Rule 316(b)

Meta Description: Discover how a holistic approach to cooling water intake systems can ensure compliance, reduce costs & save time. Examples included.

Our perspectives feature the viewpoints of our subject matter experts on current topics and emerging trends.

INTRODUCTION

In 2014, the United States Environmental Protection Agency (EPA) issued the Clean Water Act (CWA) Final 316(b) Rule (Rule) to establish requirements for facilities to reduce impingement and entrainment of fish and other aquatic organisms at cooling water intake structures (CWIS) used by certain existing power generation, manufacturing, and industrial facilities for the withdrawal of cooling water from waters of the United States (EPA 2014). The Rule establishes requirements for existing facilities designed to withdraw more than two million gallons per day (mgd) of water and use at least 25% of the water they withdraw for cooling water purposes. The Rule institutes national requirements for the location, design, construction, and capacity of CWISs reflecting the best technology available (BTA) for minimizing adverse environmental impacts for impingement and entrainment. Under the Rule, the owner or operator of a facility must comply with one of seven alternatives to meet the BTA standards for impingement mortality, and for facilities with an actual intake flow (AIF) greater than 125 mgd, they must meet site-specific entrainment standards.

In this article, we will provide examples, through a specific case study, of how applying the impingement BTA system of technologies can meet permit compliance and reduce capital expenditures.

BACKGROUND

Following the EPA issuance of the Rule, a consortium representing more than 30 regulated facilities along the Lower Mississippi River (LMR) in the State of Louisiana was formed by the Louisiana Chemical Association (LCA) in conjunction with the Louisiana Department of Environmental Quality (LDEQ). The consortium members represent facilities such as power plants, refineries, chemical plants, and industrial complexes all withdrawing water from the LMR for cooling purposes. Based on the consortium's concerns regarding the Rule, a project was developed to evaluate how the new 316(b) regulations would impact facilities and their Louisiana Pollution Discharge Elimination System (LPDES) industrial wastewater permit compliance.

To assess the seven impingement mortality BTA alternatives, different CWIS types were evaluated from existing facilities on the LMR including intakes with onshore and offshore structures (e.g., pipes out into the river with onshore intake bays and screens), intakes with sheet pile cofferdams around the shoreline intake, and dock structures with vertical drive pumps. The technologies in place (i.e., pumps, screens, wash water, return systems, etc.) for each CWIS along with the operation status (e.g., daily and seasonal) and intake location were evaluated with the Source Water Baseline Biological Characterization (SWBBC) data and the calculation baseline to estimate potential impacts.

Impingement mortality BTA 6 – systems of technologies was selected as the primary alternative because it allows the facility to choose multiple technologies and/or operation measures to demonstrate compliance. A system of technologies may include intake location, variable speed pumps, partial closed-cycle cooling, and/or other technologies—i.e., barrier nets, louvers, and diversion. Each technology employed reduces the number of organisms that are potentially impinged, resulting in a reduction in the number of organisms impinged (i.e., a reduction in the rate of impingement) and, ultimately, reducing the rate of impingement mortality. In essence, organisms that are never impinged cannot be killed by the intake structure.

A key component of permit compliance relies on understanding what operational or technical changes may have to be made to achieve a BTA standard. Considering BTA 6 compliance can be quite beneficial because it allows a facility to take credit for technologies already in place and can alleviate capital expenditures and unnecessary outages for retrofits. Under the system of technologies, a facility may be able to reduce or eliminate the capital expenditure cost by not having to make major modifications. In other words, why re-engineer for Rule compliance if a facility:

- Understands plant expectations and capabilities.
- Understands operation of water coming into its cooling system(s).
- Understands waterbody & habitat-specific conditions.
- Considers systems of technologies prior to engineering spend.
- Can demonstrate facility-specific reductions/credits.

WATER PERMITTING COMPLIANCE CASE STUDY

Project

The project involved a two-step process of 1) developing a SWBBC of the Mississippi River that multiple facilities could utilize in Louisiana and 2) developing a strategy of assessing facility technologies and operational functions that each facility can make site-specific to its location on the Mississippi River and capture in-place technologies to calculate impingement reductions.

Data Collection

The project developed a SWBBC study that included a searchable database of current and historical literature evaluating aquatic communities, including impingement and entrainment, along a 500-mile corridor of the LMR to understand how these organisms relate to specific types of intake structures and how the existing CWISs on the LMR could be affecting existing aquatic organisms in the source water (e.g., river). Data collection identified 137 studies with relevant fisheries data and 55 studies with specific data supporting fish abundances, species diversity, and fish assemblages related to habitats.

Data Review

Under BTA 6, the technologies at each facility were assessed utilizing the historic impingement data and the calculation baseline to determine the rates of impingement for the CWIS. The impingement rates were then used to demonstrate impingement reductions measured from a baseline assessment of fish density in the source waterbody at the CWIS (i.e., calculation baseline), allowing credits for reduction to be taken for in-place technologies and operations.

The SWBBC, identified and developed reference fish density data sets of available fish habitats associated with defined river reaches applicable to facility specific locations and associated river conditions. Habitat types and river conditions (i.e., river flow and stage) dictate fish community distribution in the LMR which ultimately determines where and when impingement (IM) and entrainment may occur in the system. CWIS types and locations in the source waterbody documented by known fish habitats and densities in the backwater (BW), channel border (CB), and main channel (MC) areas of the river defined those fish available and susceptible to impingement and entrainment. Figure 1 illustrates fish densities in the LMR based on habitat types. Understanding of fish assemblages in the river allowed for development of a calculation baseline (i.e., estimate of number of fish per area or volume of water) in the river to assess the CWISs and to determine what impingement BTA alternatives would best fit the existing facilities on the LMR. This concept allowed the use of a fit-for-purpose calculation baseline tailored to each CWIS location.

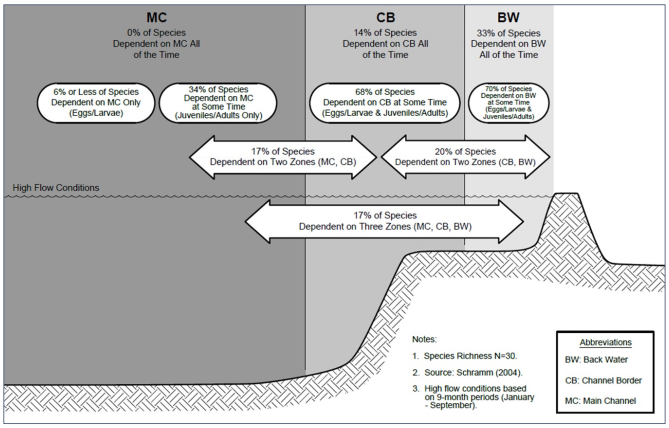

Figure 1 *- Percent habitat dependence of most common IM species.*

Application

Data from the SWBBC and the calculation baseline were then evaluated against the technologies in place to identify potential reductions. Utilizing rates of impingement and fish density numbers, facilitated the estimated impingement rates for each facility based on the volumes of water withdrawn for cooling purposes. Likewise, impingement rates were assessed based on river flow and by area and habitats in the river. The estimated impingement was then evaluated for each technology in place to determine the credit or reduction value.

The following table is an example of a facility utilizing credits based on the holistic approach for demonstrating its IM & E compliance strategy. Total system performance from this strategy yielded a 91.04% reduction in impingement.

Existing Technologies	Description of Reduction/Credit	IM Reduction/Credit	Associated Number of Impingeable Fish
CWIS Intake Location	Habitat Dependence/ Fish Distribution	33% credit based on distance from shoreline & depth outside of primary production areas & areas of high fish densities	Applying a 33% reduction (200,395.26 fish) from the calculation baseline of 607,258.36, the number of *impingeable* fish available in the calculation baseline is 406,863.1
ZOI	Reduced area of influence compared to defined area of river	66.4% credit based on % of area of ZOI and water level in relation to the cofferdam;	Applying a 66.4% reduction (403,219.55 fish) to the 607,258.36, the number of *impingeable* fish available in the calculation baseline is 204,038.81
AIF	Reduction in operational cooling water usage	27.15% credit based on reduction of DIF of 1440 MGD to AIF of 1049 MGD.	Based on a 27.15% reduction (164,870.64 fish) from the calculation baseline of 607,258.36, the number of impingeable fish available in the calculation baseline is 442,387.72
Screen Technologies	Reduced impingement mortality based on survivability of organisms	46% credit based on types of screens and operation of screens reflected by the number of organisms considered alive in the IM Study	Applying 46% reduction (279,338.85 fish) to the 607,258.36, the number of *impingeable* fish available in the calculation baseline is 327,919.51.

Table 1 *- Systems of technologies associated performance estimates (credits and impingement).*

Compliance is demonstrated with reductions achieved and credits assigned by:

- Enumerating the fish that did not become impinged.
- Comparing un-impingeable fish to impingeable fish from a calculation baseline.
- Calculating reduction, because what does not become impinged cannot become IM.
- Reflecting comparison as a percent credit for each technological/operational measure.
- Developing a measure of an overall credit to account for total system performance.

From this baseline, potential risks and reductions in impingement and entrainment were identified based on the performance of each technology identified and combined to achieve facility compliance through total system performance (i.e., source water, CWIS, cooling water system [CWS], and fish recovery and return [FRR]). Regardless of regulated compliance, impacts can be determined with a holistic approach, i.e., fisheries, habitats, and technologies.

CONCLUSIONS

The concept of evaluating impingement rates and mortality reductions by pairing facility specific CWIS technologies, operating conditions, and intake location to those fish available for impingement greatly enhanced the effectiveness of the systems of technologies compliance option. Successful acceptance of this approach at EPA regional level 4 and 6 and multiple states (Texas, Louisiana, Arkansas, Mississippi, and Georgia), provides the legitimacy of agency and client understanding to conceptually apply BTA 6 and achieve 316(b) compliance. Given that 316(b) is connected directly with the NPDES permits, all permitted facilities meeting the 316(b) requirements will be required to address compliance with the Rule during each five-year industrial wastewater permit renewal cycle. A holistic approach and use of systems of technologies provided a means to save time during the permit review process, improve compliance monitoring requirements, and reduce overall compliance costs.

ACKNOWLEDGMENTS

We would like to thank our colleagues Bill Stephens, PhD and Kurtis Schlicht for providing insight and expertise that greatly assisted this research.

MORE ABOUT J.S. HELD'S CONTRIBUTOR

Bill Stephens is a Senior Project Manager – Impact Assessment & Permitting, Technical Solutions in J.S. Held's Environmental, Health & Safety Practice. Bill's natural resource career includes multi-community bio-assessments, aquatic ecology, fishery assessments and aquaculture management, biomonitoring and ecosystem management, aquatic ecotoxicology, environmental chemistry, and surface water monitoring and assessments. Bill's professional work experience spans 41 years with 15 years as an environmental consultant and 26 years in the aquaculture industry. Collaborative work with consultants, industries, researchers, and regulators through field studies and assessments, wetland delineations, agency negotiations, and permitting have fueled his search for effective compliance solutions and appropriate management practices supporting a sustainable economy and maintaining ecosystem integrity. His knowledge, skills, and abilities allow him to interact with multiple stakeholders to prevent and solve problems.

Bill can be reached at bstephens@jsheld.com or +1 504 370 0402.