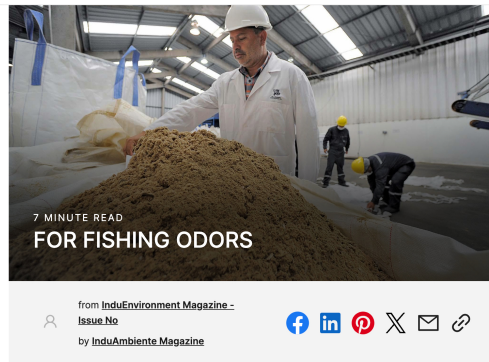
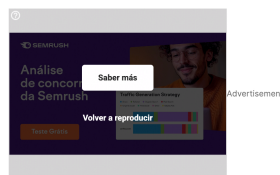




The following management measures and technologies can be used to reduce odorant emissions in fish feed plants and fishmeal and fish oil producers.

The next regulation to control odor emissions generated by fishmeal and fish oil plants and fish feed producers is in full development. The public consultation process for the draft bill concluded on May 10th, after which the Ministry of the Environment began its 120-day period to analyze comments and prepare the final bill, which should be submitted to the Council of Ministers for Sustainability for its decision during the last four months of this year.



In the meantime, regulated companies should prepare to meet the requirements of this new standard. To help achieve this, below we review some recommendations and technological and management alternatives that can be applied in this sector.

Comprehensive Diagnosis

To determine the control options that should be implemented in each case, the first step is to conduct a comprehensive diagnosis of the odor situation in the plant.

"What cannot be measured cannot be controlled, therefore, before establishing technological or management priorities, we must identify which sources generate the greatest emissions at plants and, at the same time, know which sources most affect the receptors present within the area of influence."

This is underlined by Miguel Gatica, manager of the Odor Engineering area of Proterm, a company with vast experience designing comprehensive solutions to control atmospheric emissions and that has supported fishing companies in the regions of Coquimbo, Biobío, and Los Lagos, "in the diagnosis and design of technical bases for the implementation of odor control technologies and vapor collection systems."

The engineer points out that the methodology proposed in the draft standard for diagnosing odor emissions is dynamic olfactometry (NCh 3190:2010), which allows for determining the odor concentration of all control technologies and vapor collection systems.

The engineer points out that the methodology proposed in the draft standard for diagnosing odor emissions is dynamic olfactometry (NCh 3190:2010), which allows for determining the odor concentration of all sources in the plant. "This will allow for an emissions inventory and the total odor emission rate (OER) for each plant to be calculated," he adds.

He adds that it's also important to know the flows, temperatures, and gases (hydrogen sulfide, volatile organic compounds, or others) present in each emission source. "The latter can be determined through molecular analysis to determine the gas composition and concentration at the source outlet," Gatica points out.

Technology

The Proterm specialist points out that once the comprehensive diagnosis is completed and regulatory requirements are considered, companies will be able to select the technology that best suits the context of each plant and its production process.

Regarding the alternatives available on the market, he comments: "In our experience, the most widely used technology for high concentration ranges is the wet scrubber, which has efficiencies above 90%."

However, he warns that this equipment alone would not meet regulatory requirements because, "when working in high-concentration ranges, the exhaust gases still have high odor concentrations. Therefore, to respond to the challenges posed by the draft standard, it will be necessary to complement scrubber operation with technologies suitable for low odor concentration ranges, such as those using non-thermal plasma, ozone, or

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incineration.”

Management Measures N

Miguel Gatica indicates that to complement odor abatement technologies, management measures can be implemented that also help control emissions. Examples include monitoring the freshness of raw materials, ensuring process tightness (i.e., controlling the proper capture of vapors in the various unit processes), and auditing periodic maintenance and cleaning at the plant.

It also recommends using or improving the protocols outlined in the draft regulation, which requires fishmeal and fish oil plants to report to the Environmental Superintendency: the conditions under which the plant is cleaned, the proper closure of process augers to prevent fugitive odor emissions, the operating conditions of the odor abatement technologies used in the emitting units, and an odor contingency plan. These last two reports will also be mandatory for fish feed producers.

The specialist adds: “An alternative to all of the above is the installation of environmental analyzers, i.e., devices that monitor the concentration of odor-generating gases online. This way, fisheries or food plants can monitor potential odor events generated at the plant's main sources in real time and take appropriate measures within a limited timeframe.”

Specific Cases

Algunas empresas del sector pesquero que cuentan con plantas que serán reguladas por la próxima norma ya han implementado diversas medidas de gestión y tecnologías para reducir sus emisiones de olor, las cuales también sirven como referencia de las opciones a las que se puede recurrir.

Rodrigo Zamora, Head of Sustainability at the National Fisheries Society (Sonapesca), indicates that the areas where the greatest investments should be made to comply with the requirements of the next standard are “gas washing, boilers and wastewater, fish unloading in wells and sheds where fishmeal production is stored.”

He then highlights that some of his associates have been working on these aspects for more than eight years.

In turn, Monserrat Jamett, Head of Sustainability at the Biobío Association of Industrial Fisheries (Asipes), highlights: “All Asipes member companies—Landes, Blumar, Camanchaca, and FoodCorp—currently have abatement systems that have allowed them to significantly reduce their odor emissions, ahead of the regulations promoted by the Ministry of the Environment. The most widely used technologies are scrubbers, or seawater gas washers with the addition of ozone, which remove odorous particles through an oxidation process. These investments have been accompanied by engineering projects that have improved the tightness of the processes and the capture of the gases that are subsequently treated.”

He adds that companies have been adopting good operational practices, “placing emphasis on monitoring and maintaining equipment for potential fugitive vapors and ongoing plant cleaning, strengthening their quality assurance programs. It's important to consider that proper raw material management is essential for the proper functioning of mitigation systems,” he notes.

Below are specific examples of the measures implemented by some companies, according to information provided by Sonapesca:

- Landes: In 2016, with an investment of USD 4 million, it incorporated an odor abatement system that eliminates 95% of the fume emissions produced by the operation of its flour, hydrolyzate, and liquid industrial waste (waste) plants. On the one hand, it uses a scrubber system connected to the flour and hydrolyzate plants, which basically operates by injecting dry reagent into a dirty exhaust stream to “wash” the odorous airflow. At the wastewater plant, meanwhile, ultraviolet + ozone technology is used to eliminate odors by exposing odorant particles to UV light. In both cases, the particles are processed, oxidizing and eliminating them almost 100%.
- Corpesca: En el año 2020, en su planta de Arica puso en marcha el primer scrubber-ozono, en el marco de la modernización del sistema de desodorización de gases de proceso. Al año siguiente, invirtió más de USD 3 millones para dotar a su planta de Iquique de una tecnología que abate olores, a partir del uso de ozono en la eliminación de los microorganismos y oxidación de las partículas que producen estas emisiones, durante el proceso de producción de harina de pescado.
- Orizon: Esta empresa invirtió USD 560.000 en un proyecto que incluyó el desmontaje y traslado de un enfriador desde sus instalaciones en Coronel a Coquimbo, además de la fabricación y montaje de un desodorizador para tratar olores con agua de mar, en su planta de Coquimbo. Además, ha desarrollado mediciones de olor y estudios de ingeniería para identificar las tecnologías de tratamiento más adecuadas.
- FoodCorp: A inicios de 2022 instaló en su planta de harina ubicada en Coronel un equipo lavador de gases (scrubber) que reduce el olor emitido durante su proceso productivo.





- Blumar: Last year, its Coronel plant incorporated gas absorption, neutralization, and oxidation systems, allowing it to reduce odor emissions from the production of fishmeal and fish oil by up to four times.
- Camanchaca: This year, the company launched a new scrubber at its Coronel plant. The equipment—which joins another one installed in 2016 that captures combustion gases—removes 90% of odorous gases using a technology that combines ozone and seawater, reducing the odor impact on surrounding communities.

Complete Consulting

Proterm emphasizes that it provides comprehensive consulting services so companies can properly manage their odor emissions. "In all projects, we begin by conducting a high-quality assessment using standardized methodologies (NCh 3386:2015, NCh 3190:2010, NCh 3431:2020), accredited under ISO 17025:2017, and complementary methodologies to characterize the gases that need to be controlled," says Miguel Gatica.

Once the diagnosis is complete, Proterm engineers work with the client to define the target odor reduction values, which will be governed by regulatory requirements. "After that, we develop conceptual, basic, and detailed engineering, which initially allows us to select the gas management and odor control technologies that best fit the plant's technical and economic context. The equipment involved in the project is then specified and quoted with various bidders, and the specific services to be executed are detailed. Since we do not represent any odor abatement technology or other equipment, we have the independence and objectivity to help our clients select and implement the alternative that best suits their requirements," the executive emphasizes.

The company also supports its clients in the implementation and commissioning of the project to ensure it is executed as intended, ultimately verifying the solution's performance in emissions control.



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