



SIMCO

PORT OF MONTREAL, QUEBEC

CONDITION ASSESSMENT & SERVICE-LIFE EVALUATION

The Port of Montreal is the busiest seaport on the St. Lawrence Seaway that links the Great Lakes with the Atlantic Ocean, and provides access to some 100 million Canadian and American consumers. The Port Administration is an independent federal agency that was founded in 1999, to facilitate domestic and international trade and contribute in achieving local, regional and national socioeconomic objectives.

The Port of Montreal is the pillar of a great international center for transshipment of goods where export and import services exceed 40% of Quebec's international maritime trade. To remain competitive, the Port of Montreal intends on continuing to

optimally exploit its facilities by ensuring the sustainability of its infrastructure.

In accordance to this objective, the Port Authority developed a management system for the inspection and maintenance of its wharves. This management system, called "SGIQ", was implemented to gather all information necessary to adequately assess the condition of its infrastructure; effectively plan corrective and preventive interventions required for the safety of its users and proper functioning of its port facilities; and finally, extend the service life of its infrastructure as well as protect invested capital.

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SIMCO's scope of work was to conduct a comprehensive investigation of the deterioration affecting the Port of Montreal's docks and concrete structural elements. More specifically, SIMCO was to fully characterize the mechanical and transport properties of reinforced concrete, measure the depth of contamination by chlorides (originating from de-icing operations), identify other contaminants and assess the nature and extent of the damage affecting the material.

A detailed material characterization performed on Pier 36, was the basis for the development of an analytical approach and recommendations for the integration of material components into Port of Montreal's inspection and management system, in order to effectively assess the condition of its infrastructure. The analysis of the cores extracted, indicated that reinforced

concrete was suffering from a combination of degradation mechanisms (ASR, freeze-thaw and corrosion), that would compromise the stability and integrity of Port of Montreal's structures in the mid-to-long term. Moreover, the numerical simulations performed using SIMCO's STADIUM® software demonstrated that material durability falls short thus significantly reducing the potential service life of the pier.

SIMCO's proposed changes led to more accurate diagnoses that will allow Port of Montreal to better identify future concrete degradation issues. Ultimately, the Port Authority will have a more reliable understanding of its infrastructure to ensure more effective planning of interventions necessary in order to maximize investments.



CLIENT OBJECTIVES

- Assess the current condition of the concrete docks for the effective planning of corrective and preventive interventions
- Ensure the safety and service of its docks
- Extend the service life to protect invested capital
- Identify short-term improvements to the current inspection and maintenance program
- Elaborate an effective process for the integration of analyses and results within its GIS (Geographic Information System)

SIMCO'S SOLUTION

- Define a matrix identifying the degradation mechanisms affecting the concrete wharves and their impact on the serviceability
- Elaborate a list of practical recommendations for the optimization of Port of Montreal's inspection guide and management system
- Identify enhancements to the method used to assign behavior and condition ratings of concrete elements
- Develop an algorithm to weigh the results while taking into account the location of core samples

RESULTS

- Reliable assessment of concrete performance
- High-precision data for the effective implementation of corrective and preventive measures
- Important recommendations for improvements to the inspection manual and protocol that would lead to a full analysis of concrete properties
- Insight to different alternatives that would not have been possible without access to SIMCO's predictive tools and technologies



CONTACT US

+1 877.656.0266
+1 418.656.1003
sales@simcotechnologies.com
www.simcotechnologies.com

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