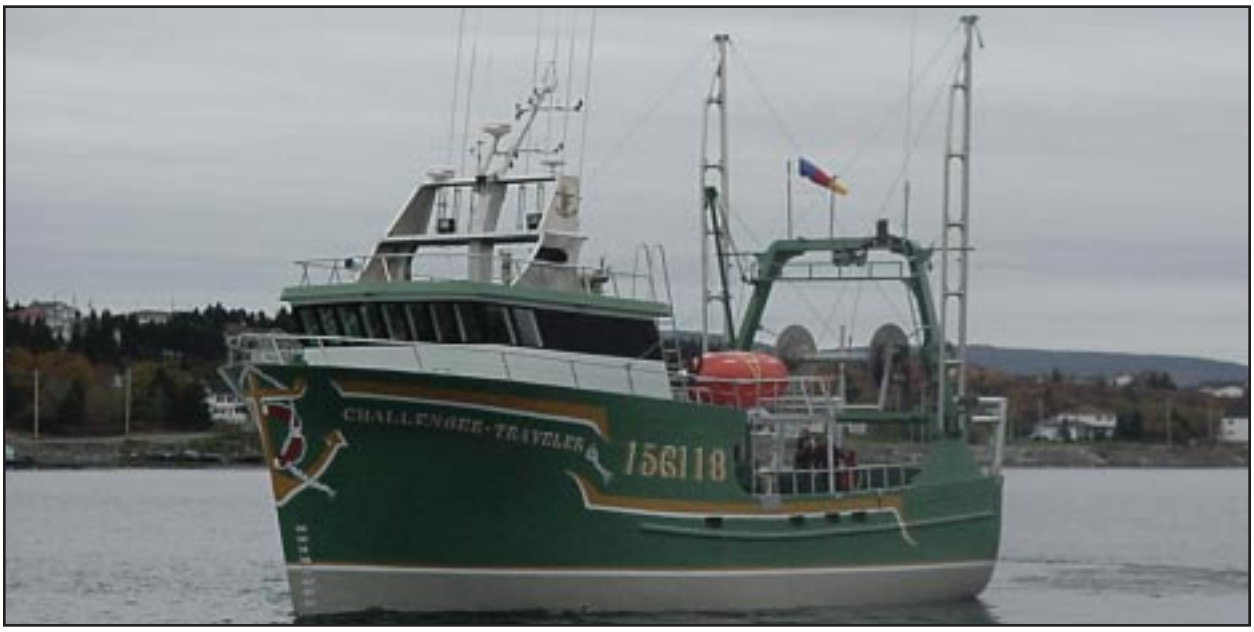
FISHERIES DIVERSIFICATION PROGRAM

Productivity and Product Enhancement

Project Summary: FDP 61 **2002**

Refrigerated Seawater Holding System Tested



The M.V. Challenger Traveler.

Quality seafood begins at sea with the harvesting sector. Holding and handling practices directly affect the condition of the final seafood product.

It is with this reality that industry, with support from the Department of Fisheries and Aquaculture, is now searching for and publicizing new technologies capable of producing top quality seafood for the world market.

When Captain Calvin Petten decided to have a new vessel built, he too felt it was important to incorporate the latest ‘quality' technology available. In 2000, a cost-shared project was conducted with Captain Petten on his new vessel, the M.V. "Challenger Traveler," under the Fisheries Diversification Program (FDP). The project involved testing and reporting on the results of a refrigerated seawater crab holding system.

Canada

Government of Newfoundland and Labrador

Background

Historically in Newfoundland and Labrador, ice was the only onboard means of seafood preservation available. While it served the industry well, it has limitations in maintaining low temperatures in vessels not equipped with mechanical refrigeration traveling to distant offshore fishing zones over several days. An ice melt can occur rapidly, especially in warmer summer months.

The Newfoundland and Labrador shellfish industry has seen significant change in the past ten years. Harvesting takes place farther from shore and trip lengths can exceed four to five days.

Harvesters in the over 55-foot fleet are faced with a challenge to improve handling and holding technologies and to maintain quality for longer periods.

Snow crab require a cool, moist environment. Ice serves as a coolant, but may not be always effective in maintaining adequate moisture levels over greater distances and longer fishing times.

One type of holding technology which assists in maintaining quality is a refrigerated seawater system where crab is kept alive under refrigerated and oxygenated ‘underwater’ conditions, somewhat duplicating its natural habitat.

The basic concept of the refrigerated seawater system involves the chilling of recirculated, aerated seawater on board a vessel by mechanical refrigeration and the flooding of a watertight hold of the vessel into which the freshly caught crab is placed.

The use of refrigerated seawater holding systems for crab has proven successful all around the world, especially in Alaska. Its introduction to the local harvesting fleet now promises the same sort of success.

Crab is lowered into tanks through raised manholes.

Methodology

The refrigerated system installed in this vessel was equipped with a second or backup system in order to have a fallback cooling technology in the event of a system failure. This is especially critical in offshore fishing zones, where system failure could result in the loss of an entire catch due to temperature increases and travel time to dockside.

The overall process is as follows:

- The vessel's hold was filled with sea water pumped from the ocean shortly following departure from dockside. There were eight compartments in the vessel hold, each capable of holding

about 10,000 pounds of live crab.

- The refrigeration system was used to begin the mechanical process of low ering the temperature of the surface water to 37F/ 38 F.
- A water supply pump was used to continuously introduce fresh and clean seawater which also serves in the control of harmful ammonia.
- An air system was used to put more oxygen into the water, allowing the snow crab to survive in an adequately oxygenated underwater environment.
- The eight individual compartments in the vessel hold were filled with live snow crab through raised stainless steel necks or manholes on the deck of the vessel. Compartments were filled one at a time until all crab had settled and there was ample space to allow the animals to move slightly. (It is critical that each compartment is completely full in order to prevent damage to the live snow crab caused by a "sloshing effect." It also reduces the ‘water-free surface' that could affect vessel stability.)
- A chute was also used to transport the crab to adjacent tanks. There was essentially no physical shock to the crab, which resulted in high-quality, live crab at dockside. (Studies have shown that dropping crab in excess of two feet causes enough stress to result in reduced quality or death.)
- Temperatures of the refrigerated sea water were continuously monitored by a control panel in the wheel house.
- The first compartment to be offloaded was drained at dockside. This left the remaining tanks operational, with recirculated seawater, maintaining quality while waiting.

Results

The final report identifies overall benefits of a refrigerated seawater systemas:

- High-quality, premium snow crab in a lively state meaning improved returns for all;
- The elimination or a substantial reduction in microbial spoilage;
- Increased fishing time;
- Elimination of ice costs;
- Increased ability to harvest in zones out to and beyond 200 miles;
- Ability to land in distant ports;
- The provision of a cool and humid environment for snow crab;
- The reduction of breakage as a result of excessive handling;
- Allows Newfoundland crab to remain internationally competitive;
- Variations in surface temperature do not adversely affect the catch;
- Snow crab are free from mud or other bottom components;
- Reduction of dead and critically weak crab by up to 100%;
- Reduction of contamination caused by breakage to the animal's carapace;
- Vessel hold is used for other species without significant modifications; and
- Northern shrimp storage is possible using this system for shorter times.

Conclusions

The installation of a refrigerated seawater system onboard the M.V. "Challenger Traveler" has been quite successful from a quality and economic perspective.

The results of all landings exceeded that of similar vessels that did not utilize this type of mechanical refrigeration.

The incidence of dead crab was 0%, 0.30% less than that of other selected vessels and the incidence of critically weak crab was 0.56% when the refrigerated system was used, compared to 8.04% being critically weak with a non-refrigerated seawater system of crab storage, meaning a difference of 7.48%.

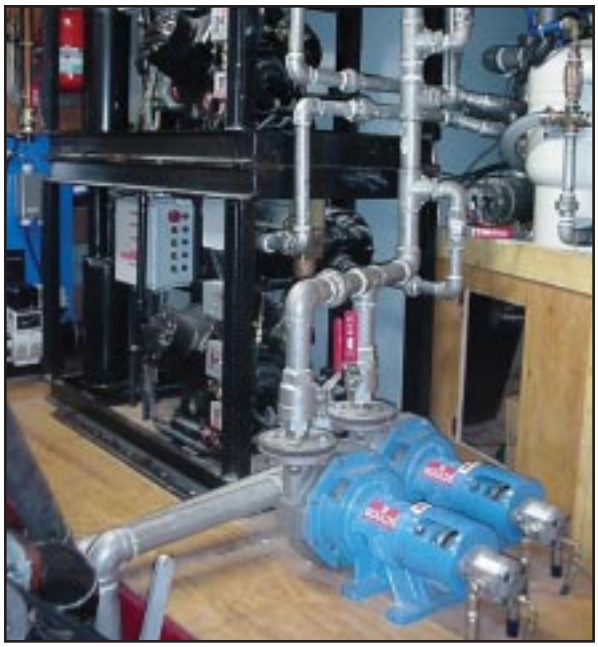
The fish processing company considered the raw material from Captain Petten's vessel to be superior to crab landed using traditional icing methods.

These factors have allowed the harvesting enterprise to extract maximum value for the catch. With individual quotas where only a set amount may be harvested, this is especially relevant.

International seafood markets recognize suppliers who have raw material sources that use refrigerated seawater systems. Because of this emphasis on quality, the trend toward improved holding technologies for snow crab and other species continues to increase in the Newfoundland and Labrador harvesting sector.

There are now other RSW systems onboard local vessels. In order to prosecute regions ranging from 170 to 250 miles and achieve maximum value, adoption of this type of technology is critical.

The initial investment is about $150,000 to $200,000, depending on the number and type of modifications required to accommodate this type of system.



The compression unit and power supply.

Harvesters building new vessels may consider installing these systems when the vessel is under construction. This will reduce installation and design costs associated with modifying older vessels.

However, upon consideration of the return on investment in the absence of rejected product, the rewards are evident.

With respect to this system being suitable for holding other species, additional research is required.

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The $10 million Fisheries Diversification Program is part of the $81.5 million Canada-Newfoundland Agreement Respecting the Economic Development Component of the Canadian Fisheries Adjustment and Restructuring Initiative.