

North Atlantic Seafood Forum 2019

Improving fish quality and volume utilization with twin containers

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Introduction – history of fresh fish handling





Development of fish containers on board Icelandic wet fish vessels

- 1972: Stern trawlers; storage of fish in plastic boxes (40–90 L, depth: ca. 15 – 26 cm)
- 1982: Storage of fish in plastic containers (660 L, depth: 58–60 cm)
- 1992: Storage of fish in plastic containers (460 L, depth: 40–42 cm)
- 2012: New container for even more delicate species (340 L, depth: 31–32 cm)











Design objectives of twin containers

- Lower transport and storage costs due to better volume utilization during transport of empty containers
- Improve fish quality due to
 - improved hygiene (containers closing each other, possible to store inside)
 - lower pressure on fish at bottom compared to traditional (460 L) containers
- Improve stacking and handling safety



Traditional 460 L containers



New twin containers (yellow female, gray male)



Partners in the national R&D project T-KER 2017-2019



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Funding





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The transport challenge and the new twin containers



Traditional containers take almost as much space in a truck/container when empty as when packed with fish



New twin containers stacked as loaded (above) and empty (below) in a truck/container

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Volume utilization – Empty containers



Empty containers	460	Twin containers
No. of containers in a stack with max height 2.53 m	4	8
Height of container stack (cm)	220	246
Total no. of containers in HC-container	80	166
Total volume capacity of containers in HC-container (L)	31,680	48,472
Improved volume utilization in HC-container compared to 460 containers		53.0%
Total length of container load in HC-container (m)	11.33	11.55
Fish weight in each container (kg)	300	221

 Possible to transport around 50 – 60% more fish in a fully-loaded container/truck with empty twin containers as compared to a fully-loaded container/truck with traditional 460 L containers



Drip loss of iced cod stored in different containers at 0 - 1 °C



Drip loss in the bottom layer of containers after 6 and 10 days of storage (n=9-10)

Ref: Tryggvason, R.I. 2018. The effect of insulated food container design on fish quality and transport costs. Master's thesis. University of Iceland.

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Drip loss of superchilled salmon stored in different containers at around – 1 °C



- Packaging depth did not negatively affect other quality parameters studied:
 - Quality Index Method (QIM)
 - Gaping
 - Firmness
 - pH
 - General Descriptive Analysis

Drip loss of whole salmon after 10 days of storage (n=16-20)

Ref: Tryggvason, R.I., Margeirsson, B., Karlsdóttir, M., Ólafsdóttir, A., Guðjónsdóttir, M., Arason, S. Effects of food container depth on the quality and yield of superchilled and iced Atlantic salmon. Unpublished article.



Trials with superchilled rainbow trout

- Two trials in May July 2017
 - Transport from Westfjords, Iceland to Poland (8 days by land, sea, land)
 - Transport from Westfjords, Iceland to Matis in Reykjavik + storage (13 days)
- Fish traditionally chilled, packed with ice in EPS vs. superchilled, packed without ice in EPS or containers
- · Lid vs. plastic cover vs. no cover
- Drain grid at tub bottom vs. no drain grid
- Temperature, quality preservation, microbial measurements, handling of containers



Ref: Björn Margeirsson, Gunnar Þórðarson, Anton H. Guðjónsson. 2017. <u>Transport of chilled and superchilled rainbow trout in insulated</u> <u>containers and expanded polystyrene boxes – Trial shipment from Westfjords, Iceland to Slupsk, Poland</u>. Technical report. Sæplast, University of Iceland.

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Fish quality - elasticity

Evaluate inelasticity by folding the fillet over on the table, releasing it and observing:

The elasticity in the fish muscle expresses whether the fish muscle can be folded over and then return to its original form. The longer the fish is stored; the fillet will lose elasticity and become more inelastic.

Score	Description
0	- Elastic: The fillet straightens out quickly
1	 Somewhat elastic: The fillet straightens out slowly
2	- Inelastic: The fillet remains folded over



Ref: Fishery and Aquaculture Industry Research Fund (FHF). 2010. Guide for evaluating fillet texture in Atlantic salmon. Available at http://www.fhf.no/prosjektdetaljer/?projectNumber=900109.

- Superchilled fish is better than traditional
- Tubs (depth 29 40 cm) are as good as EPS boxes (depth 20 cm) for superchilled fish
- Decreased elasticity if lid/cover is missing
- Drain grid possibly better odour of gills
- No traces of *Listeria Monocytogenes* found at the bottom of one of the 250 L tubs after unloading



Elasticity of rainbow trout transported in different packaging. SC: Superchilled fish. Trad: Traditionally chilled and packed fish in ice.



Conclusions and future work

- 50 60% higher volume utilization with twin containers as compared to traditional containers.
- Superchilled processing of salmon makes it possible to use 29 60 cm deep, reusable tubs instead
 of 20 cm deep EPS boxes with regard to quality
- Packaging depth can be more important for fish drip loss than fish quality
- Lids/plastic cover seems to be necessary more research work needed on lids/plastic covers and drain grids
- · Handling of new twin containers with fork lift trucks must be trained
- Lighter containers will be preferred (handling + energy usage)
 => need for stacking and hoisting experiments





Thank you!

Further information:

http://europe.saeplast.com/en/downloads/white-papers-and-reports

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