

Improving Fish Quality with Ozone at Fresher Than Fresh



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Talk Outline

- **Company Background**
- **Problem Description**
- **Plant Processing**
- **Ozone System**
- **Cost Benefits of Prepackaging**
- **Ozone Benefits**
 - Shelf-Life Extensions
 - Product Quality Improvements
 - Other Ozone Benefits
- **Health & Safety Issues**
- **Conclusions**



Fresher Than Fresh Plant



Fresher Than Fresh – the Company

- **Seafood processing and packaging**
- **Serves retail groceries & institutions**
- **Products: fresh fish, fish cakes, dips**
- **Wash products with ozone/water**
- **Package using Modified Atmosphere Packaging (MAP) with CO₂ + N₂**
- **Fresh-Check label added**
- **FTF guarantees 10-day shelf life**

THE FRESH-CHECK® INDICATOR

Extra Check ✓ for freshness™



USE



USE NOW



DO NOT USE

USE BEFORE CENTER IS DARKER THAN OVAL

Fresher Than Fresh Products



Problem Description

- **Safety of fish, seafood products & plant**
- **Prior to ozone, packaged products did not always last 10-days**
- **Plant had to lower shelf-life guarantee to 6-7 days for some products**
- **Late '90s – evaluated ozone**
- **2003 – installed ozone full-scale**

Plant Processing

- **ALL plant processing water is ozonated**
- **Plant + equipment are washed repeatedly during the day**
- **All fish products are washed before packing**
- **Fish are packaged in 35% CO₂ + N₂**
- **Fresh Check label is added**

Figure 1. Fresher Than Fresh Plant Processing Schematic

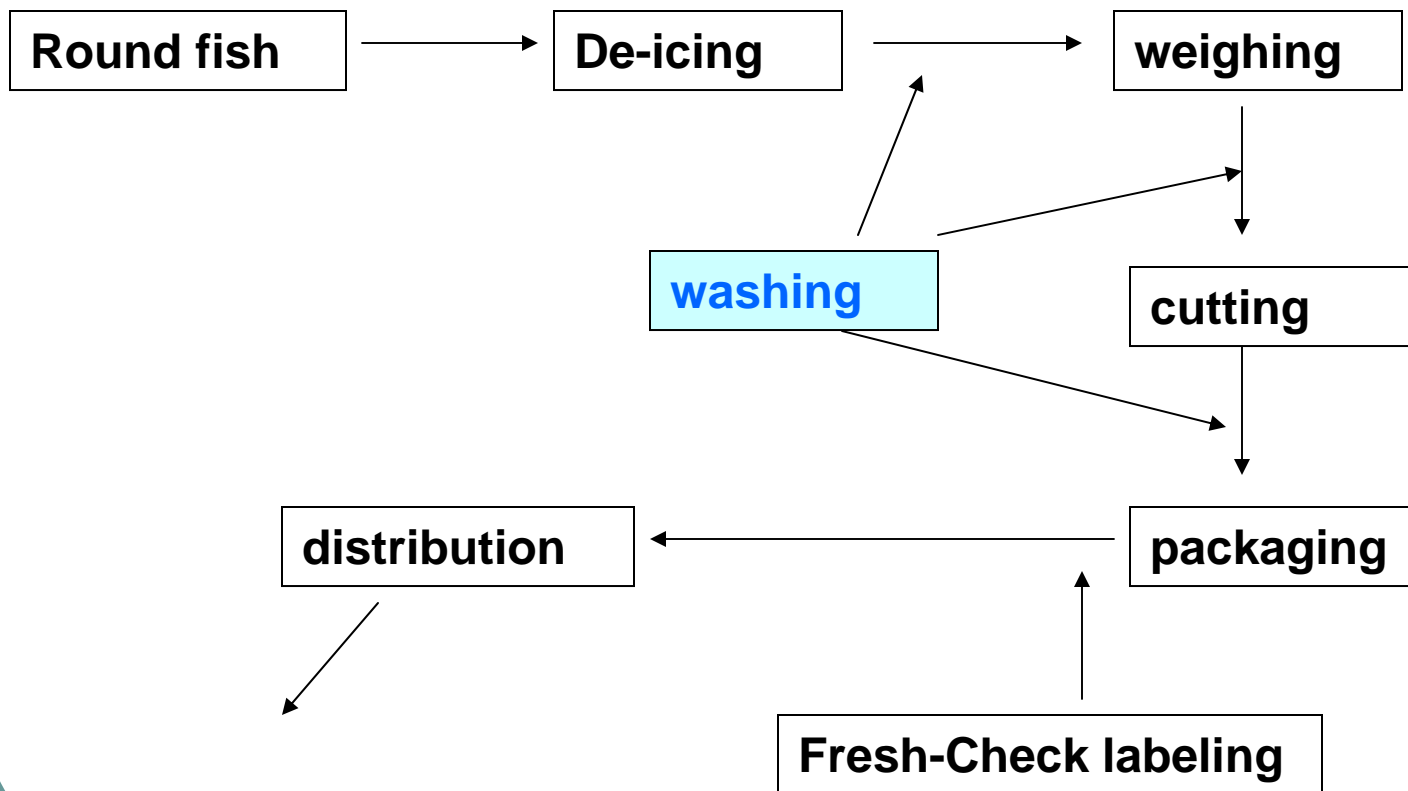
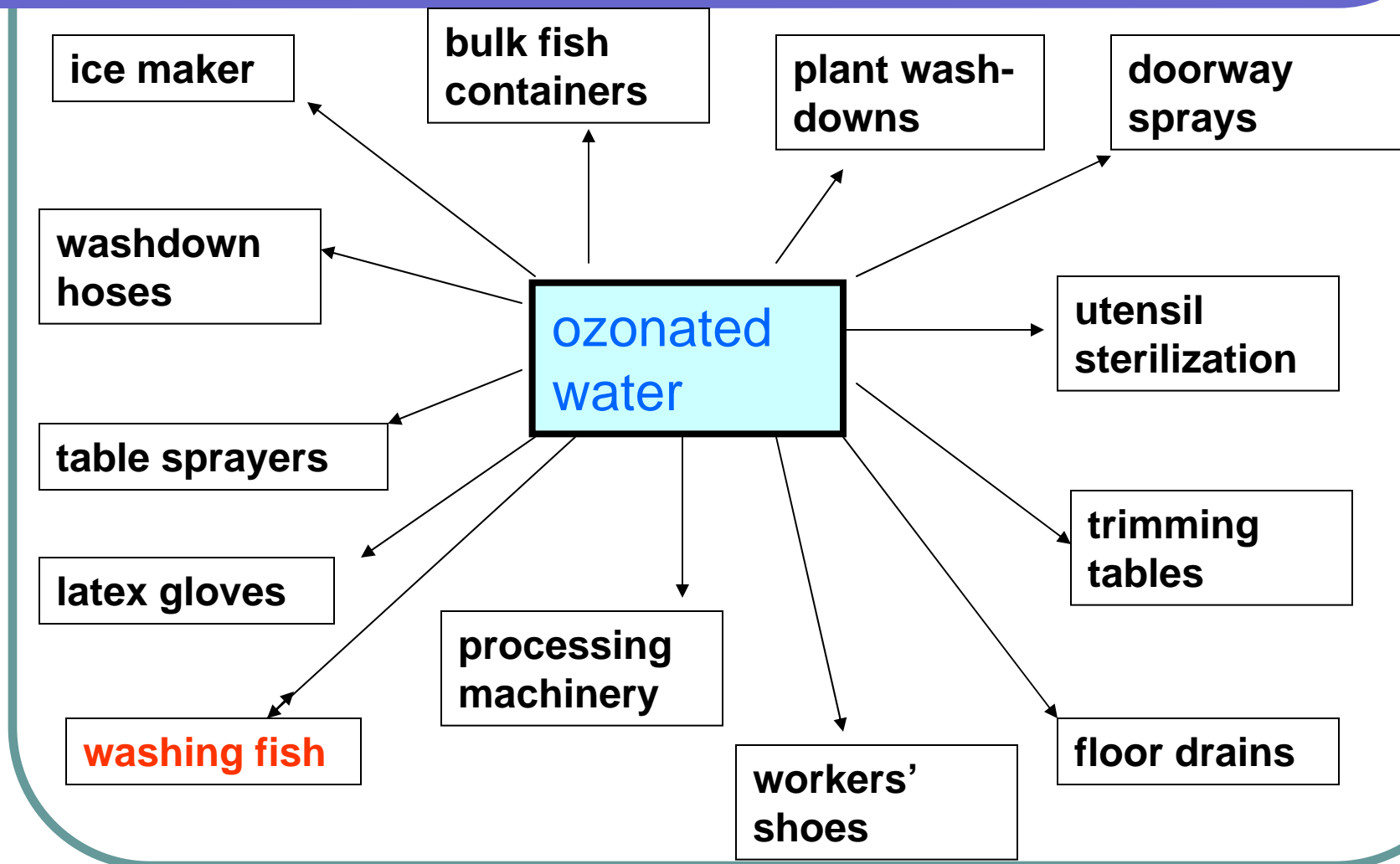


Figure 2. Ozonated Water Uses



Prepackaging Saves Retailer –

- **Labor to package fish in retail store**
- **Cleaning/sanitizing to allow meat processing in-store after fish handling**
- **Decreases fish shrinkage**
- **Allows retailer to display ALL products**
- **Saves retailer lots of \$\$\$ -- will explain later**

Ozone System

- **ClearWater Tech Model HDO3-II – 2003**
- **Oxygen concentrator**
- **Can deliver up to 150 gpm water containing 7 mg/L dissolved ozone**
- **~ 100 gpm of ozonated water is available at all times in the plant**
- **Rosemount Ozone Controller – max of 2.5 mg/L dissolved ozone**

CWT Ozone System – F-T-F



Ozone in Water @ F-T-F

- **As long as ozone in process water is <1.5 mg/L,**
- **Ozone in plant atmosphere never exceeds OSHA permissible level = 0.1 ppm, time-weighted average/8 hrs/day**
- **Dedicated piping – ozone generation to ice maker**
- **Nozzles and sprayers deliver water to plant sites and fish products**

Ozone Processing Benefits



PREPACKAGING - 1

- **FTF packaging costs ~ \$0.40 per pack less than at a retail store**
- **Retailers sell ~ 360 packages/week, thus one retailer saves ~ \$144/week in packaging costs**
- **30% greater “on-display” provides increased sales**
- **20% less shrinkage of fish when prepackaged**

PREPACKAGING – 2

- **Based on these 3 factors only, and extending to fish sold nationally in retail store chains, prepackaging savings =**
- **\$935/week per store (\$48,620/yr/store)**
- **For a chain of 300 stores – annual savings are close to \$15 MILLION**

SHELF-LIFE BENEFITS

- **APC on ozone-washed fish products are consistently 36 hrs behind (= 1.5 days) products not ozone-washed**
- **Modified Atmosphere Packaging further extends shelf-life**
- **Maintain temperature < 39°F – extends further**
- **A combination of factors succeeds**

PRODUCT QUALITY

- **Prior to ozone, some packages expired in 6-7 days, others in 10 days**
- **Since installing ozone + MAP + $< 39^{\circ}\text{F}$ storage -- all FTF products now are guaranteed 10 days**
- **Products now meet 10-days (and more) consistently**

PREPARATION GUIDE ON BACK

WILD CAUGHT FLOUNDER FILLET



it's easy down here



deep blue

GUARANTEED FRESH

EASY TO PEEL

SHRIMP



it's easy down here



deep blue
SEAFOOD CO

GUARANTEED
Keep refrigerated und



FARM RAISED **SALMON FILLET**



Starboard

The freshest seafood out there.



GUARANTEED FRESH • Keep refrigerated under 38° F
To learn more about our unique, stay-fresh packaging, visit us at www.starboard.com.

Croakers – Headed & Gutted



Additional Benefits of Ozone -1

- **Microorganisms also are killed on floors, in drains, on latex gloves, on workers' shoes, in ice-making machine, etc.**
- **Lower BOD and COD in wastewaters**
- **Ice machine is slime-free**
- **Plant cleanup is faster – less slime**

Additional Benefits of Ozone -2

- **Sanitizing wash-downs now conducted during daytime breaks without having to remove fish products from the area**
- **Plant sanitary conditions are improved**
- **Plant doesn't smell like a fish plant now**
- **Employees' clothing doesn't have that "fishy" smell**

Concluding Comments - 1

- **Ozone is proven beneficial at F-T-F**
- **Constant control of aerobic bacteria**
- **Plant sanitation is greatly improved**
- **Fish washed in ozone/water, packaged in modified atmosphere and stored <39°F consistently have >10-day lives**
- **Prior to ozone, some fish could only be guaranteed 6-7 days**

Concluding Comments – 2

- **Plant operations are essentially odor-free**
- **Lower wastewater BOD and COD levels**
- **Ice maker operates free of slime**
- **Plant cleanup is faster – due to less slime**

Ronnie Wrenn - 2007

“Anyone sneaking into our plant at night to steal our ozone equipment will have a big fight on his hands!!”

ACKNOWLEDGMENT

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instrumentation**