



Effect of Temperature on Shelf Life

| Time Holding Temp. | Holding Temperature (°F) | | | | | | | | | | | |
|---|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 29 | 30 | 32 | 34 | 36 | 38 | 40 | 45 | 50 | 55 | 60 | 65 |
| Equivalent Age of Product in Days at 32°F | | | | | | | | | | | | |
| 2 hours | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.4 | 0.5 | 0.7 |
| 4 hours | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.5 | 0.7 | 0.9 | 1.1 | 1.3 |
| 6 hours | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.7 | 1.0 | 1.3 | 1.6 | 2.0 |
| 12 hours | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.9 | 1.0 | 1.5 | 2.0 | 2.6 | 3.3 | 4.0 |
| 18 hours | 0.5 | 0.6 | 0.8 | 0.9 | 1.1 | 1.3 | 1.6 | 2.2 | 3.0 | 3.9 | 4.9 | 6.0 |
| 1 day | 0.7 | 0.8 | 1.0 | 1.2 | 1.5 | 1.8 | 2.1 | 3.0 | 4.0 | 5.2 | 6.5 | 8.0 |
| 2 days | 1.4 | 1.6 | 2.0 | 2.5 | 3.0 | 3.6 | 4.2 | 5.9 | | | | |
| 3 days | 2.1 | 2.4 | 3.0 | 3.7 | 4.5 | 5.3 | 6.3 | | | | | |
| 4 days | 2.8 | 3.2 | 4.0 | 4.9 | 7.1 | 8.4 | | | | | | |
| 5 days | 3.5 | 4.0 | 5.0 | 6.2 | | | | | | | | |
| 6 days | 4.1 | 4.7 | 6.0 | | | | | | | | | |
| 7 days | 4.8 | 5.5 | 7.0 | | | | | | | | | |
| 8 days | 5.5 | 6.3 | 8.0 | | | | | | | | | |
| 9 days | 6.2 | 7.1 | | | | | | | | | | |
| 10 days | 6.9 | 7.9 | | | | | | | | | | |
| 11 days | 7.6 | | | | | | | | | | | |
| 12 days | 8.3 | | | | | | | | | | | |

Source: Sea Grant Extension Program Publication by Robert J. Price, Seafood Technology Specialists, Department of Technology, University of California, Davis, sponsored by NCAA through the California Sea Grant College Program.

“Monitoring the cold chain is critical to our quality assurance practices. To improve operational efficiencies, we transitioned from strip chart recorders to electronic temperature monitoring from our Mexican suppliers to our warehouses. The results have enabled us to ensure vendor compliance of all SOP’s (Standard Operating Procedures), allowing us to continue delivering the highest quality shrimp possible.”

Ciro González

Distribution Manager
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San Diego, CA

As the world’s leading provider of cold chain visibility solutions, Sensitech enables global leaders in Food and Pharmaceuticals to track and monitor assets across the supply chain to protect the integrity of temperature-sensitive products. Sensitech is a business unit of Carrier Corp., the world’s largest provider of heating, air conditioning and refrigeration solutions with operations in 172 countries. Sensitech is an ISO 9001:2000 company and is based in Beverly, Massachusetts, with offices in Amsterdam, Calgary, Melbourne, Redmond and Santiago as well as service and distribution offices around the world. For additional information, call +1-978-927-7033 or visit www.sensitech.com. © 2006. Sensitech Inc. All Rights Reserved. All trademarks and service marks are the property of Sensitech Inc.

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Improve Seafood Quality with Good Cold Chain Management





Cold Chain Visibility for Perishables

Moving food products efficiently through the supply chain is complicated in today's competitive business environment—especially when the products are as highly volatile as seafood. Multiple handoffs mean in-depth coordination between trading partners for transportation, packaging and handling. Compound these logistical issues with mandated record keeping. And let's not forget: there is a direct correlation between how well you manage the cold chain and the quality you deliver.

Temperature is considered a universal critical control point in every seafood HACCP plan. Whether you are processing, shipping or storing fresh or frozen, maintaining the cold chain is key to delivering high quality and collecting the highest price—not to mention repeat business.

Partnering with Sensitech will ensure that temperature stays your friend. We understand the complexity of cold chain management and have the tools and expertise you'll need readily available to turn your supply chain into a strategic business advantage.

Electronic Time & Temperature Monitors

Recognized as the most accurate and reliable in the industry, our monitors are patented with time and temperature alarm settings and are downloadable for viewing, analysis and regulatory record retention. The functional design allows for single event or cumulative "time out of range" programmable settings for easy accept/reject decision making by viewing through the monitor's LCD panel.



Cold Chain Visibility Applications utilize hands-free monitoring capabilities of RFID within a mesh networking environment to provide the ability to collect and analyze thousands of transactions to uncover and address systemic problems within every segment of the cold chain.

- **ColdStream™ PTS:** provides end-to-end cold chain visibility Plant to Shelf
- **ColdStream™ CL:** provides full cold chain visibility for a Closed Loop delivery process

Cold Chain Visibility Services

Utilize Sensitech's cold chain experts to help you achieve optimal performance:

- Identify the root causes of cold chain problems
- Assess your current cold chain practices
- Develop practical solutions to improve your cold chain
- Validate the effectiveness of your current SOP's
- Ensure your processes are adhering to regulatory standards

About Sensitech

Sensitech is the leading provider of cold chain visibility solutions enabling our customers to track and monitor assets across the supply chain to protect the quality and integrity of their temperature sensitive products. Our portfolio includes:

- Validated Data Acquisition Instruments for in-transit, in-storage and in-process temperature monitoring
- Enterprise Software Applications providing both desktop and web-enabled, scalable data management and exception reporting
- Cold Chain Visibility Services for analyzing cold chain data to identify systemic weaknesses and variability in processes, eliminating problems before they occur to ensure the delivery of meaningful, measurable process improvements

As a global market share leader in food and pharmaceutical cold chain data management services, Sensitech:

- Monitors over three million trips annually
- Hosts data for over 80 of our top food and pharmaceutical customers
- Protected over \$250 billion of our customers' assets over the past 10 years