

# Field Device Strategies for Sustainability

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## Agenda

- Genentech: Company Overview
- Continuous Improvement Initiatives
- Condition Based Maintenance
- Advantages of Non-Invasive Wireless Monitoring
- Specific Solution Examples
  - Steam Traps
  - Ultra Low Critical Freezers
- Implementations to-date

## Genentech: Company Overview

**Description:** Leading Biotechnology company in drug discovery, development, manufacture, and commercialization  
\$10B US Sales. ~11,000 Employees.

**Mission:** Our mission is to be the leading biotechnology company, using human genetic information to discover, develop, manufacture and commercialize biotherapeutics that address significant unmet medical needs.

**Manufacturing:** Cell Fermentation Process

330,000 liter capacity across five campuses:

So. San Francisco CA, Vacaville CA, Oceanside CA, Hillsboro OR, Singapore



## Some of the Cost Saving Initiatives

This project has been initiated as part of our continuous improvement efforts.

Key challenges and guiding principles:

- ***Reduce energy costs***, while enabling sustainable manufacturing
- ***Improve uptime and reduce labor costs*** via better plant asset management and condition based maintenance
- Achieve this with the ***fastest payback*** and ***minimal plant disruption***

## Considerations for Condition Based Maintenance

Equipment / Issue	Wastes Energy	Labor Intensive	Unplanned Downtime	Comments
<b>Steam Traps</b> Steam traps fail, causing loss of costly steam	✓	✓		Undetected leaks can cost >\$5K per year per trap. Manual monitoring of traps is labor intensive.
<b>Ultra-low Critical Freezers</b> Old stand-alone equipment fails, causing downtime and potential loss of expensive samples		✓	✓	Compressor problems remain undetected until failure, leading to expensive emergency replacement and potential loss of samples.
<b>Air Handling Units</b> Old equipment has no monitoring or diagnostics. Increased downtime and consumables use (filters, belts).		✓	✓	Time-based maintenance and replacement of filters (consumables), vs. condition based maintenance.
<b>Water Pretreatment System</b> No monitoring on filters, pump, support utilities. Higher consumables (filter) use, no energy usage baseline.	✓	✓	✓	Costly multimedia filter change-outs not optimized, labor intensive manual rounds, lack of energy use baseline.

# Considerations for Conditions Based Maintenance – Potential Benefits and Savings

## Potential Benefits

### Steam Traps

- Proactively detect and avoid leaks
- Reduce inspection needs

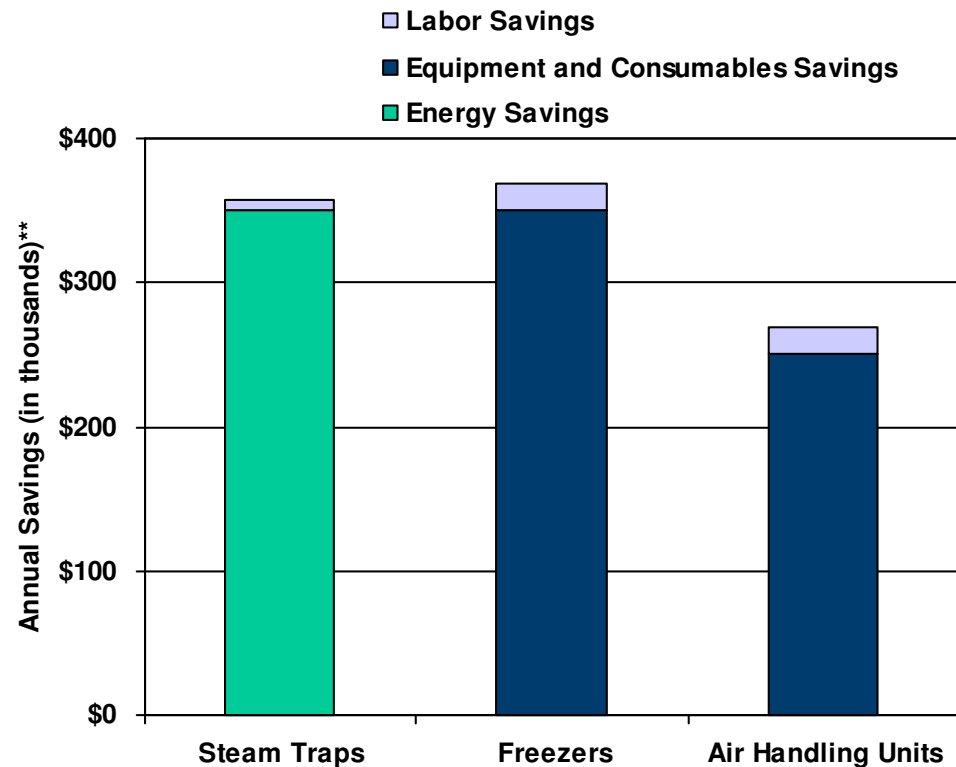
### Ultra-Low Critical Freezers

- Proactively detect failures
- Avoid freezer replacement
- Avoid sample loss

### Air Handling Units

- Save labor and filters
- Predictive maintenance reduces downtime

## Potential Savings



\*\*Annual savings estimated based on 500 units.

## Advantages of Non-Invasive Wireless Monitoring

	<b>Traditional Monitoring</b>	<b>Non-Invasive Wireless Monitoring</b>
<b>Plant Disruption</b>	<ul style="list-style-type: none"> <li>• Invasive</li> <li>• Process interruption required</li> <li>• Wiring required</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Non-invasive, clamp-on devices</b></li> <li>• <b>No process interruption</b></li> <li>• <b>Minimal wiring</b></li> </ul>
<b>Reliability</b>	<ul style="list-style-type: none"> <li>• Power source required</li> <li>• Real-time data collection</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Battery operated</b></li> <li>• <b>Once/second data collection</b></li> </ul>
<b>Engineering</b>	<ul style="list-style-type: none"> <li>• Changes existing system</li> <li>• May require engineering change management</li> <li>• System re-commissioning required for restart</li> </ul>	<ul style="list-style-type: none"> <li>• <b>No changes to existing system</b></li> <li>• <b>Minimal engineering change management</b></li> <li>• <b>No system restart required</b></li> </ul>
<b>Infrastructure</b>	May require new software	<b>Interface available for integration into existing infrastructure</b>
<b>Cost</b>	\$3,000 - \$5,000 per point	<b>\$750 - \$1,500 per point</b>



***Traditional Monitoring Solutions are expensive and disruptive, resulting in long payback.***

***Non-Invasive Wireless Monitoring offers a cost effective alternative.***

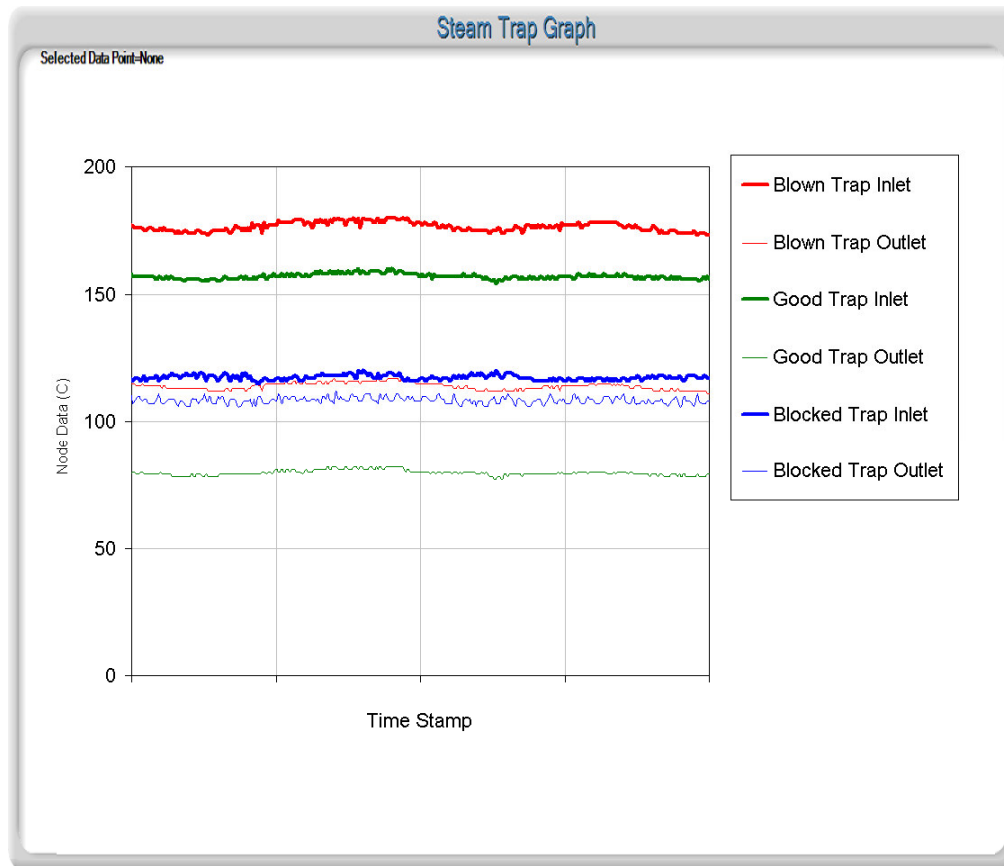
## Solution for Steam Traps

- Provides early indication of steam leakage or blockage, which lead to steam trap failure
- Manual inspection typically done annually – labor intensive, do not catch problems in timely manner
- One year payback on investment





# Solution for Steam Traps



## Implementation to Date

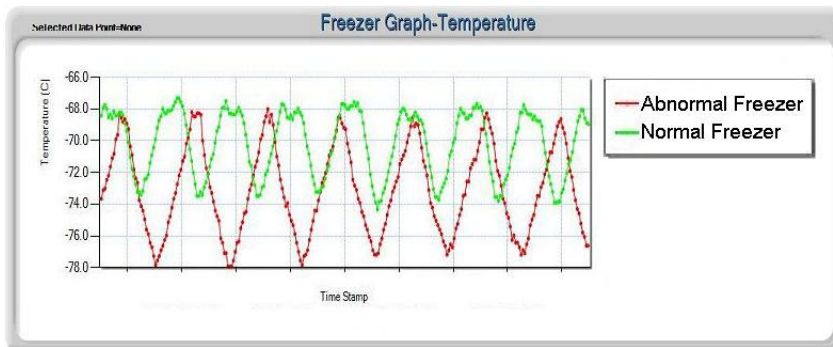
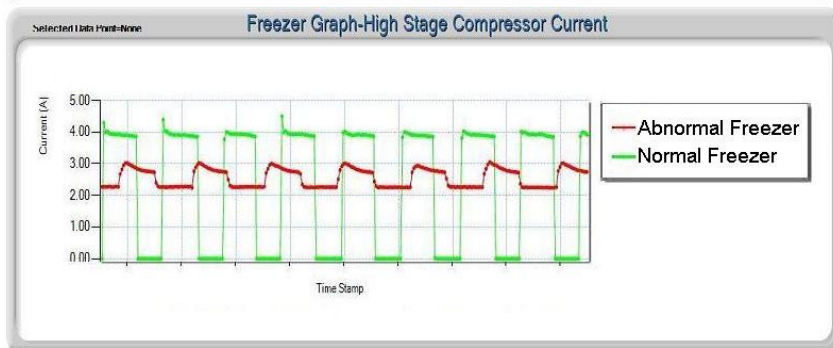
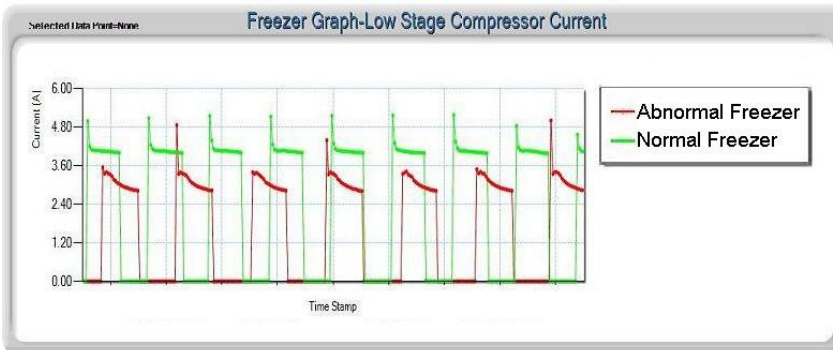
- 56 Steam trap monitors installed
- Project Start: 09/2008
- \$42,000 Installation Cost
- \$42,525 Estimated Savings to Date

# Solution for Ultra-Low Critical Freezers

- Monitors health of  $-80^{\circ}\text{C}$  freezers holding critical material and samples
- Measures critical parameters including high-stage and low-stage compressor current, door open/close status, and internal temperature
- Provides early indication of refrigerant leak or door seal problem, which lead to freezer failure



# Solution for Ultra-Low Critical Freezers



## Implementation to Date

20 Freezer monitors installed

- Project Started: 09/2008

- \$20,000 Installation Cost

- \$20,000 Estimated Savings to Date

***First month of monitoring already paid for project cost through early failure detection***

## Implementations to Date

- South San Francisco Campus (HQ)
- First installation in Q1 2008
- By 2008 year-end, total of 100 units installed
- Estimated annualized savings >\$75K
  - Steam Traps, 56 units
  - -80°C Freezers, 20 units
  - Air Handlers, 4 units
  - Reverse Osmosis Water Treatment, 15 units
  - Other Utility Systems, 5 units

Questions?

## Potential Savings Calculation (slide 6)

	Steam Traps	Freezers	Air Handler Units
<b>Energy Savings</b>  <b>or</b>  <b>Equipment Savings</b>	500 traps, 20% failure rate 53 lbs/hr steam loss @ \$15/1000lb \$580 steam loss per trap monthly  6 month leakage (\$350K)  vs.  minimal leakage	500 freezers, 20% failure rate \$12K replacement cost ea. \$7K repair cost ea.  100% replacement (\$1.2M)  vs.  70% repair (\$850K)	500 AHUs 1 HEPA / AHU @ \$5000 av.15 pre-filters / AHU @ \$100 ea  HEPA replaced annually, pre-filters quarterly (\$500K)  vs.  HEPA replaced bi-annually, pre-filters semi-annually (250K)
	<b>\$350K Annual Savings Potential</b>	<b>\$350K Annual Savings Potential</b>	<b>\$250K Annual Savings Potential</b>
<b>Labor Savings</b>  <b>\$45/hr rate</b>	20 minute trap inspection annually ~170 hr annually  Reduced to no inspection	30 minute PM time semi-annually ~500 hr annually  Reduced to 5 min. semi-annually ~83 hr annually	60 minute PM time semi-annually ~1000 hr annually  Reduced to 35 min. semi-annually ~583 hr annually
	<b>\$7.7K Annual Savings Potential</b>	<b>\$19K Annual Savings Potential</b>	<b>\$19K Annual Savings Potential</b>

## Implementation Savings Calculation (slide 12)

Installed Units	Cost	Savings	Install Date	Savings Calculation
56 Steam Traps	\$42,000	\$42,525	09/2008	2 – 1/4” traps blown for 6 months at \$15/1000 lbs = 210,000 lb/month x 6 months x 15/1000 x 2 traps = \$37,800 2 – 1/8” traps 50% blown for 6 months at \$15/1000 lbs = 52,500 lb/month x 50% x 6 months x 15/1000 x 2 traps = \$4,725
20 Freezers	\$20,000	\$20,000	09/2008	\$5000 per freezer x 4 failed freezers = \$20,000
4 Air Handlers	\$4,800	\$13,400	04/2008	3 AHUS with 4 pre-filters each, changed 4x a year, reduced to 2x per year at \$100 per filter = 4 x 2 x \$100 x 3 = \$2,400 1 AHU with 55 pre-filters, changed 4x a year, reduced to 2x per year at \$100 per filter = 55 x 100 x 2 = \$11,000
15 RO Monitoring Points	\$18,000	TBD	04/2008	TBD: labor savings, troubleshooting, downtime savings **Note: savings hard to calculate due to regulatory impact of maintenance changes.
5 Other Misc. Points	\$6,000	TBD	04/2008	TBD: labor savings, troubleshooting, downtime savings
<b>Totals</b>	<b>\$90,800</b>	<b>\$75,925</b>		<b>Payback of 14 months</b>