

SmartLightingTM
by **SMARTWATT**
Energy Inc.

**LED + Controls
Case Study:**

United States Cold Storage

September 8, 2011
Chris Covell

SMARTWATT
Energy Inc.

Right Light

SmartLightingTM

Right Place

Right Time

Lighting Terms



- **Fixture Efficiency = Total Design Lumens of Fixture / Total Lumen Output**
- **Fixture Optics = The distribution of lumens of each lighting fixture. Fixture optics is often defined as spacing criteria.**
 - Example - 1.2 SC at the 180 degree and 1.0 SC at the 90 degree.
- **Lumens per Watt = Total Lumens / Total Wattage**
- **CRI = Color Rendering Index = 100% = Sun's Light**
- **Foot-Candle = Measurement of Light**



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What is the “right light” technology for cold storage applications?

HID

- Most popular lighting in cold storage
- Power intensive
- Long start up time of fixtures – no cycling
- Metal Halide has poor lumen maintenance
- High Pressure Sodium has poor color rendering
- Poor optical control
- 16,000 to 24,000 L70 life
- Lamps contain mercury
- Lamp breakage concern
- New electronic metal halide fixtures offer attractive efficiency and better lumen maintenance.
- Dimming of fixtures possible

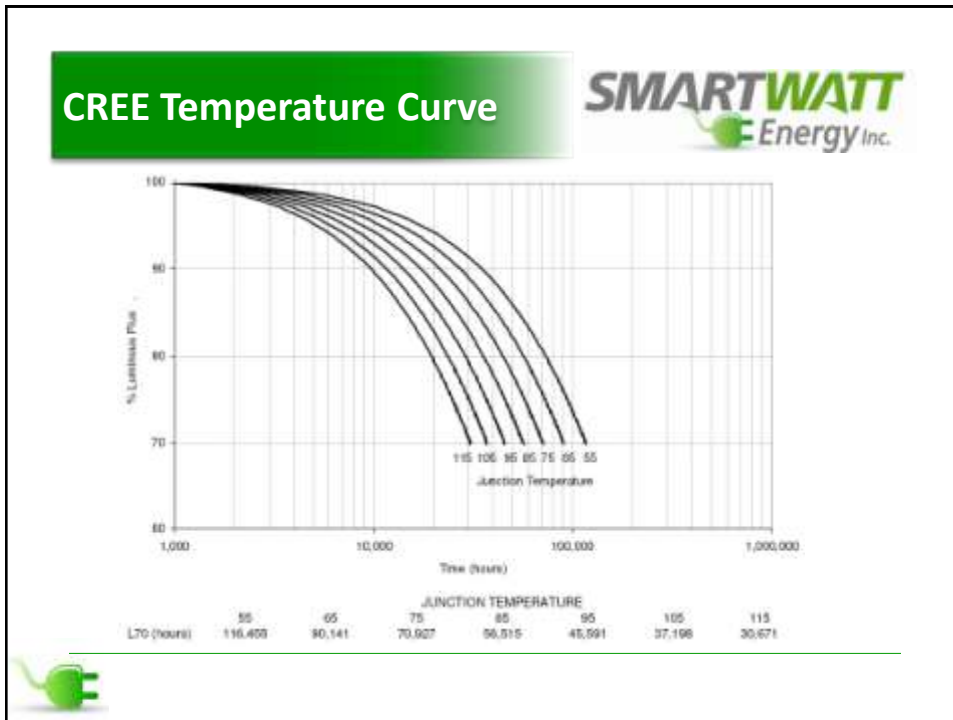
Fluorescent

- Long warm up period in cold environments, cycling in cold storage difficult
- Lumen output is poor in below freezing temperatures
- Better fixture optics than HID
- Contains mercury
- Lamp breakage concern
- Economical fixture cost
- In temperatures above 40F Fluorescent offers most attractive ROI
- Long lamp life of 50,000 hours+
- Large incentives from utility rebates


LED

- Instant on/off capability, even in below 0 environments
- Best fixture optics
- Maximum energy savings
- Decreased maintenance costs - L70 life of over 70,000 hours.
- Cold temperatures increase life of LED's
- Increased lumen performance in cold environments
- No mercury
- No Glass
- Large incentives from utility rebates






Comparable Operational Cost



What is the true cost of each Lighting System within a typical 350,000 square foot cold storage warehouse?

# of Fixtures	Lighting System	*Annual Operating Hours	Annual kWh	**Annual Energy \$	*** Annual Maint. \$	Annual Lighting Operating \$
300	4 lamp T-5 HO	8,760	620,208	\$74,425	\$7,500	\$81,925
300	320 w PS MH	8,760	917,172	\$110,061	\$7,500	\$117,561
250	163w LED w/ Control Systems	1,752	71,394	\$8,567	\$0	\$8,567

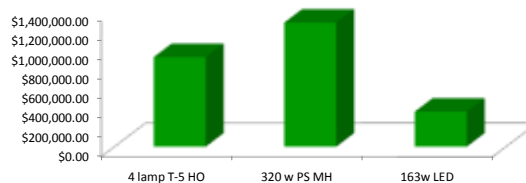
*Assumes 20% occupancy rate.
 **Does not include thermal related energy cost and assumes \$.12 per kWh
 *** Assumes 10 year annual average.



10 – Yr. Comparable Total System Cost



# of Fixtures	Fixture Type	Installed Cost (before rebates)	Annual Operational \$	10 Year Total System \$
300	4 lamp T-5 HO	\$105,000	\$81,925	\$924,250
300	320 w PS MH	\$105,000	\$117,561	\$1,280,606
250	163w LED	\$275,000	\$8,567	\$360,673



LED Purchasing Criteria



When Deciding which LED fixtures to use, below is some basic criteria to examine:

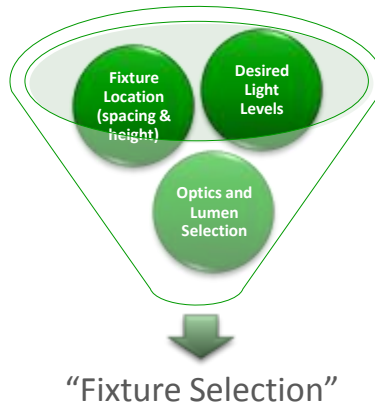
- Analyze LED pricing on a cost per Lumen basis.
- Color Selection of LED's
- Look for fixtures that offer incremental control options.
- Look for fixtures that have multiple optics options.
- Look for fixtures that have a variety of Wattage and Lumen output options.
- Make sure provider develops lighting layouts showing point by point projections of new lighting system.
- Make sure fixture has LM79 testing and the LED has LM80 testing data.
- Make sure fixture is DLC approved.



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The “right light” & the “right place”?



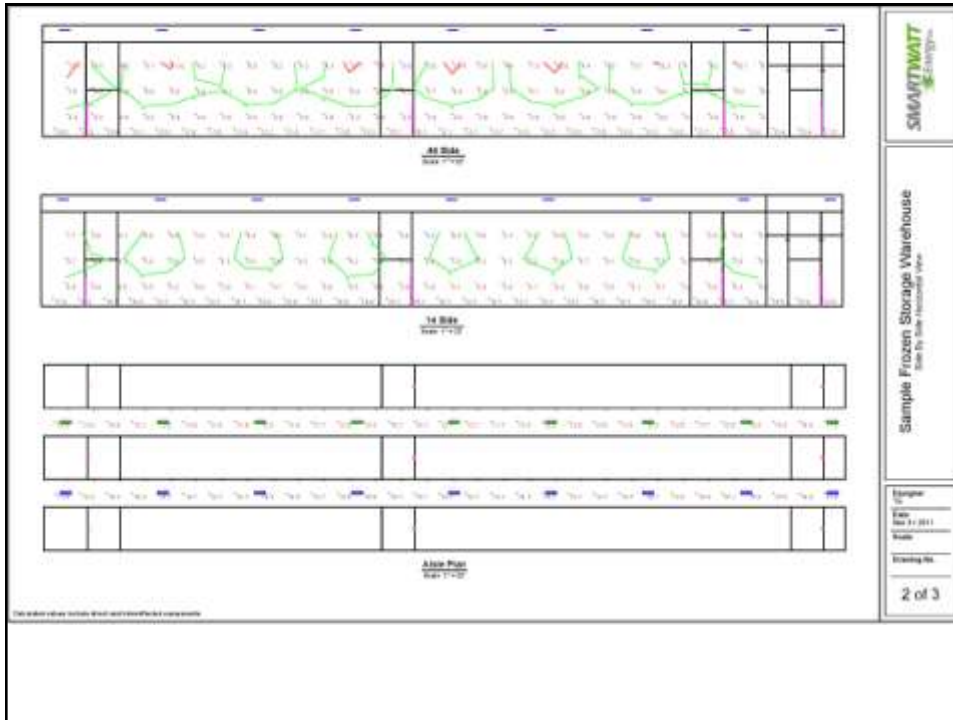
Benefits of Using Less LED's



Fewer LED's Equals:

- Lower Project Cost
- More Energy Savings
- More Energy Savings = Higher Rebate for many utilities
- Fewer Fixtures to Maintain

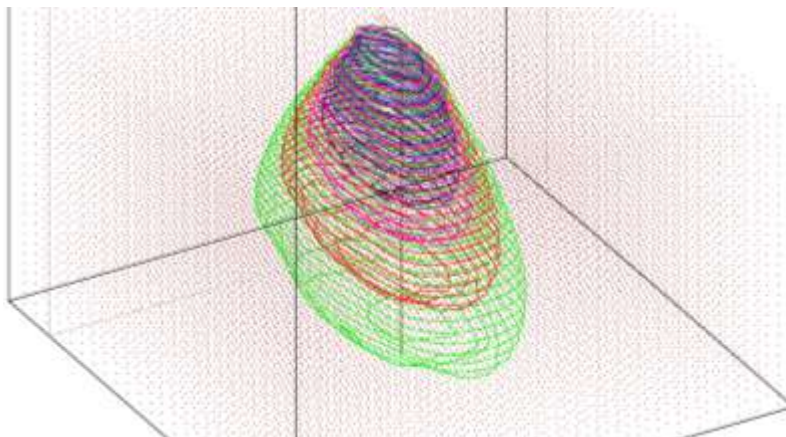




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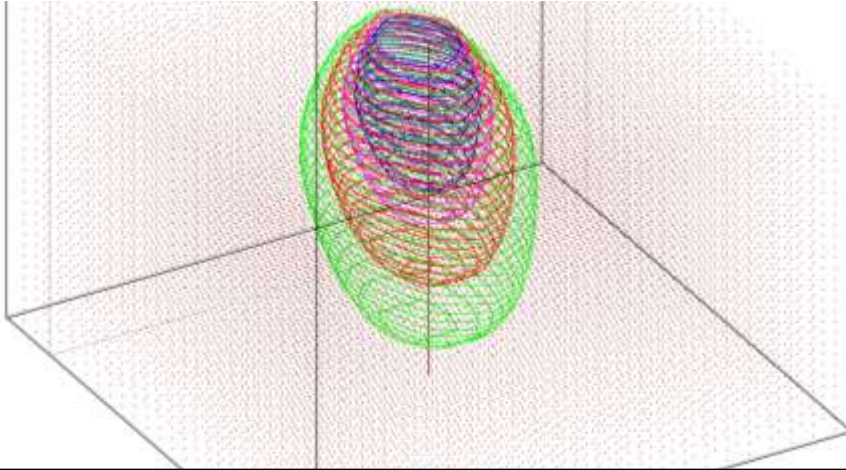
Lusio 2.0 120W LED High Bay Aisle Lighter
by Lusio Solid State Lighting



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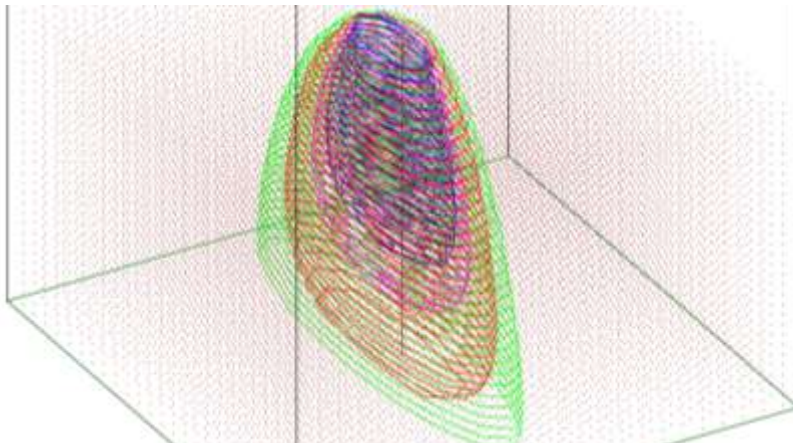
Proteon 147W LED High Bay w/focused lens
by Lithonia Lighting



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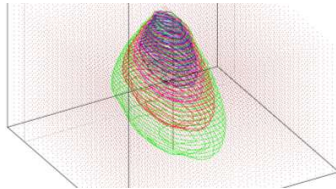
3-Bar 163W LED High Bay w/10 degree lens
by Albeo Technologies



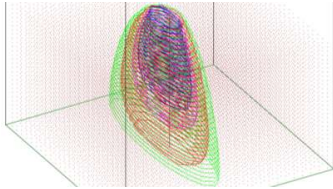
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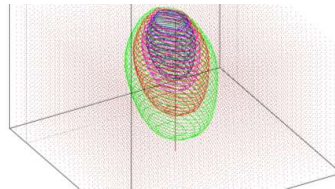
Lusio Solid State Lighting



Albeo Technologies



Lithonia Lighting



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Dial Light LED High bay

Lithonia Proteon

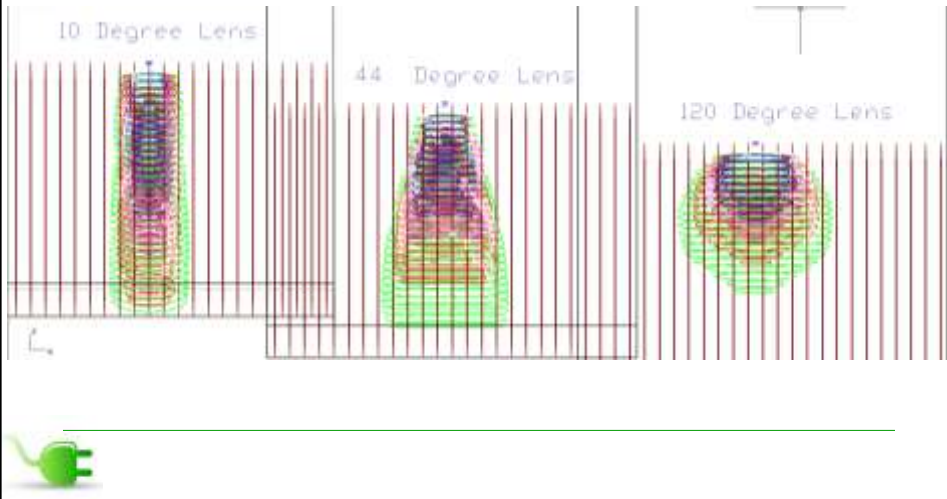


Albeo C-Series



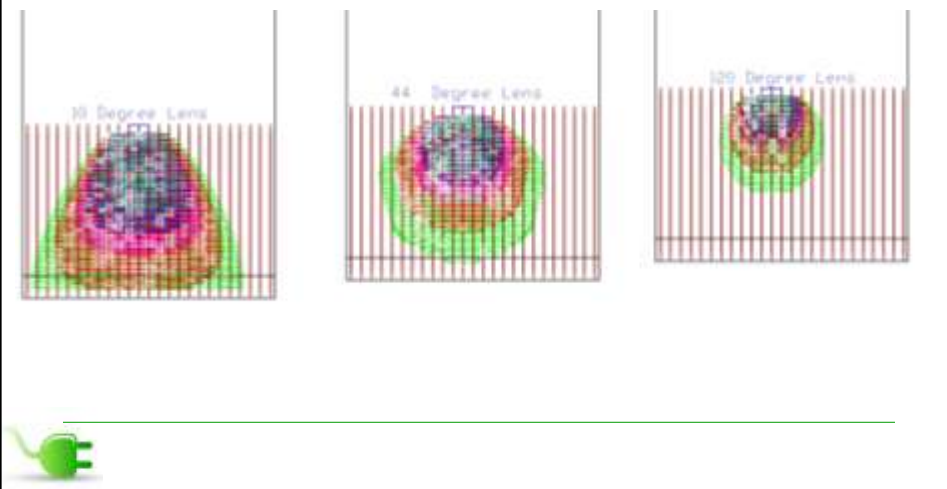
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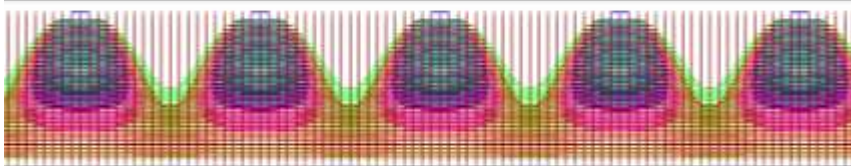
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3,624 LED High Bay Fixtures w/30 degree lenses Fixture spacing = 40' Mounting Height = 32'



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The “right time” for lighting
in cold storage applications?



Benefits of Turning Lights Off:



- Save more energy - including reduction in cooling load
- More energy savings relates into additional Utility Rebate
- Control systems make project eligible for EPA tax savings
- Fixtures will operate less therefore significantly increasing their useful life – looking at fixtures that can operate for 30+ years



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What to Look For In Control Systems:



- For cold storage application, wireless system eliminate the need to use expensive cold temp rated Ethernet cable.
- Look for a system that can be incrementally added to your system. If you need it, buy it...
- Look for a system that can be added to your entire facilities lighting system. The control system should easily incorporate your office fixtures, outdoor lighting, warehouse, etc.
- Look for system that has multi site functionality.



CASE STUDY



United States Cold Storage Scope:

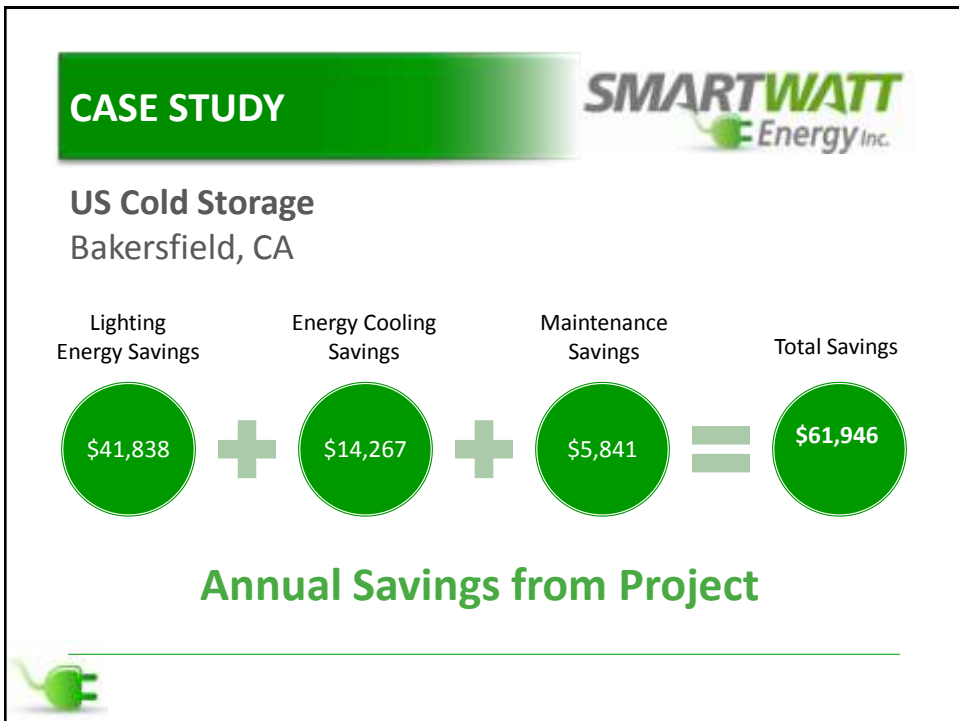
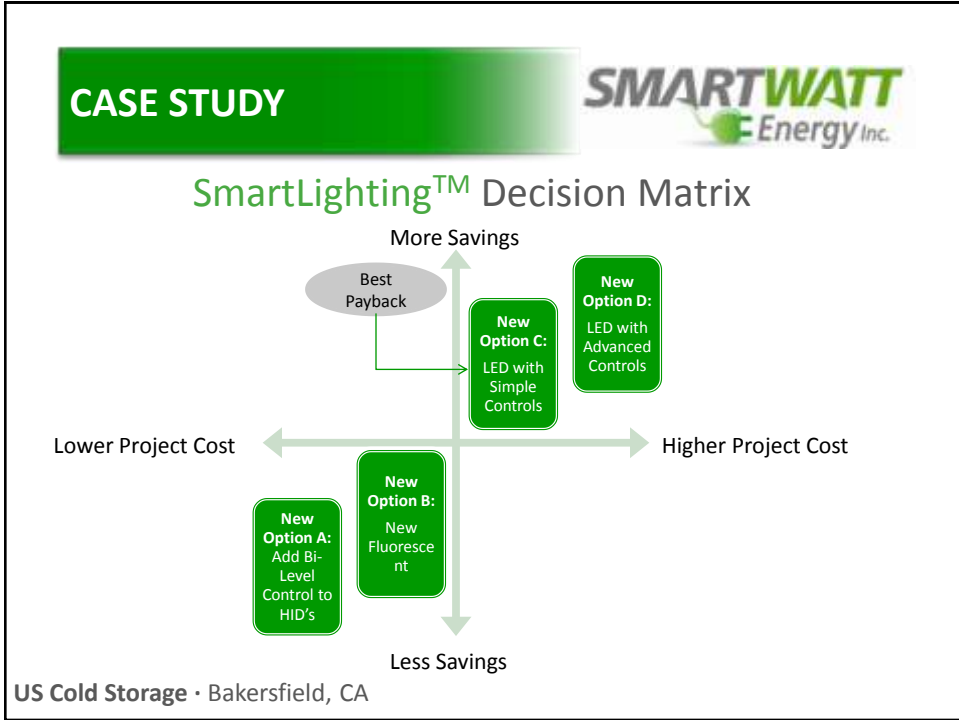
- Achieve 18FC average in warehouse aisles
- Replace 400w HPS
- Combine motion controls with advanced web based control
- Complete full building lighting retrofit – offices, docks, maintenance, etc.



SmartLighting™ Solution

Tracy, CA
Bakersfield, CA

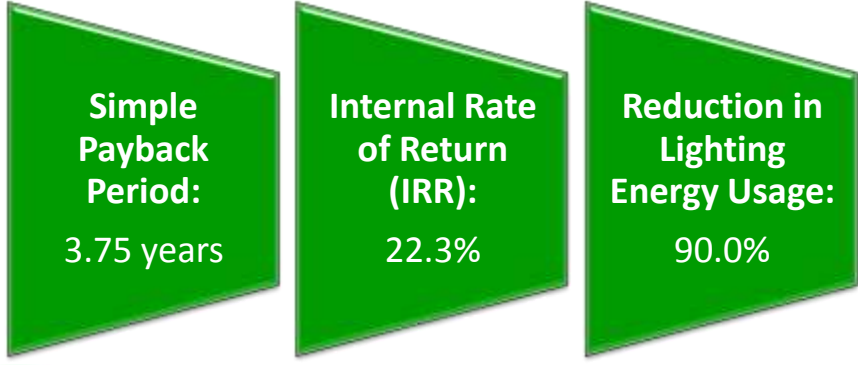




CASE STUDY



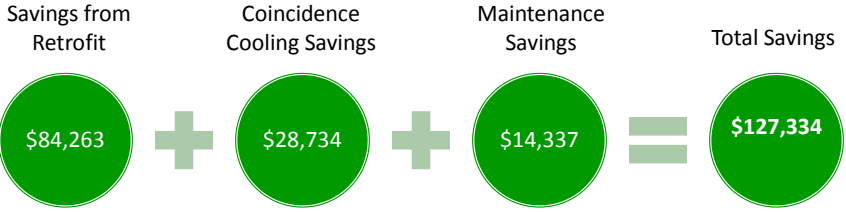
US Cold Storage
Bakersfield, CA



CASE STUDY



US Cold Storage
Tracy, CA



Annual Savings from Project



CASE STUDY



US Cold Storage

Tracy, CA · LED Fixtures + Motion Control System

**Simple
Payback
Period:**

1.61 years

**Internal Rate
of Return
(IRR):**

35.2%

**Reduction in
Lighting
Energy Usage:**

90.0 %



Lighting Improvements



United States Cold Storage Lighting Results

- Improved Color Rendering Index from 26 to 75
- Increased Foot-candles
- Increased the uniformity of the foot-candles – standardized lighting levels between buildings
- Replaced old HID dimming system that caused maintenance problems
- Control system makes it easy for plant operators to curtail lighting load during peak events.



TESTIMONIALS



“As part of our company-wide sustainability program, we conducted IRR analysis of various supply-side energy savings options—wind, solar, etc.—and none of them made financial sense. The paybacks were just too long. In comparison, our SmartLighting solutions have come with IRRs of 35.2% and 22.3%.”

-Dan Dietrich, US Cold Storage
Project Engineer

“The ability to reduce costs *and* reduce greenhouse emissions is a key reason we chose SmartWatt Energy for multiple facilities nationwide.”

-Fred Walker, Americold Vice President of
Engineering



Comprehensive Solutions



Variable Frequency Drives (VFDs)

Applications:

- Compressors
- Pumps
- Evaporator Fans
- Condenser Units
- Demand Ventilation



HVAC Upgrades
Motor Replacements



SmartProfitProgram



Sample Project Cash Flow with SmartProfitProgram



Total Investment:	\$261,755
Utility Incentive:	<u>-\$ 56,586</u>
Total Investment:	\$205,169
Monthly Savings:	\$10,611
Monthly Repayment:	<u>\$ 4,062</u>
Monthly Profit:	\$ 6,548
Annual Profit:	\$78,583

Cash in your pocket. Energy savings for your facility.



LOCATIONS





energy savings for **cold storage**



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