Smardt Chillers

The Global Leader in Oil-Free Chillers

SMARDT

Who is Smardt?

- **First & Largest Global Oil-Free Chiller Manufacturer**
  - Manufacturing in Australia, Canada, USA, Germany, China, Brazil
  - First in the world to manufacture oil-free chillers (2000)
  - Largest Oil-free Chiller Installation Base with 5,000+ installed
  - Largest user of Danfoss Turbocor Compressors in the world
- **Pioneer, and Largest Oil-Free Chiller supplier in most countries**
  - Largest Chiller Supplier in Australia
  - Extremely experienced across a diverse range of climates and industries

Smardt Worldwide

Smardt has approximately 5,000 oil-free chillers installed worldwide, and there are about 50,000 oil-free compressors installed globally.

SMARDT

Who is Smardt?

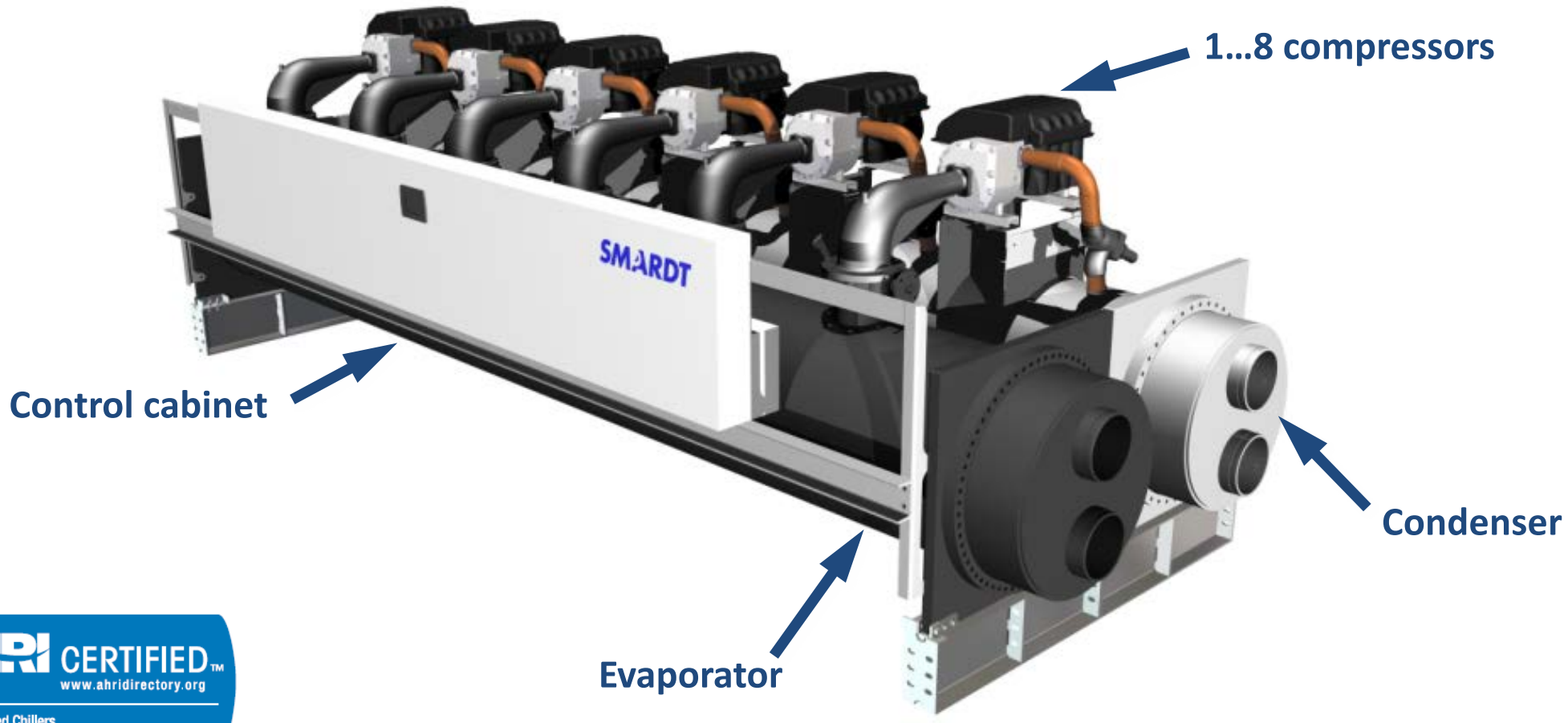
- **Global Leader in Oil-Free Chiller Technology**
  - Largest range of oil-free chillers in the world (**60-2500Ton**)
  - Most advanced R&D centres in the world for Oil-Free Chiller Technology
  - Exclusive authorised oil-free compressor rebuild and repair centre in house

- **Specialised, Focused & Dedicated on Oil-Free**
  - Exclusively manufactures High Efficiency, Oil-Free Chillers
  - Environmentally Friendly, Innovative Cooling Solutions
  - Reduced Chiller Operating Costs through advanced designs and controls

SMARDT

Smardt Water Cooled Chillers (T^W-Class)

60-1200tonR(200-4,220kWr)



TURBOCOR TT

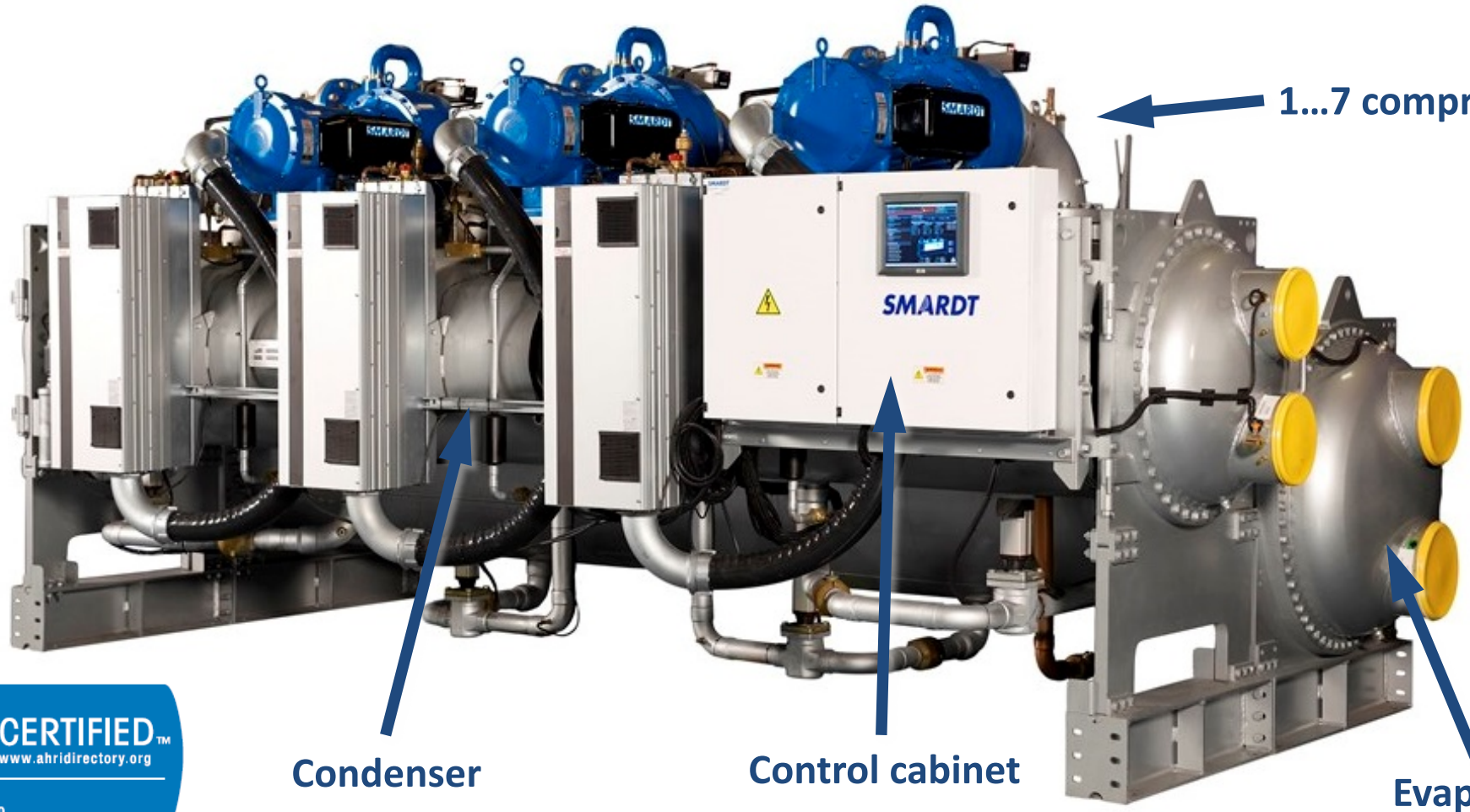
COMPRESSOR

AHRI CERTIFIED™
www.ahridirectory.org
Water-Cooled Chillers
AHRI Standard 550/590
C

SMARDT

Smardt Water Cooled Chillers (V-Class)

350-2500tonR(1230-8,800kWr)



TURBOCOR VTT

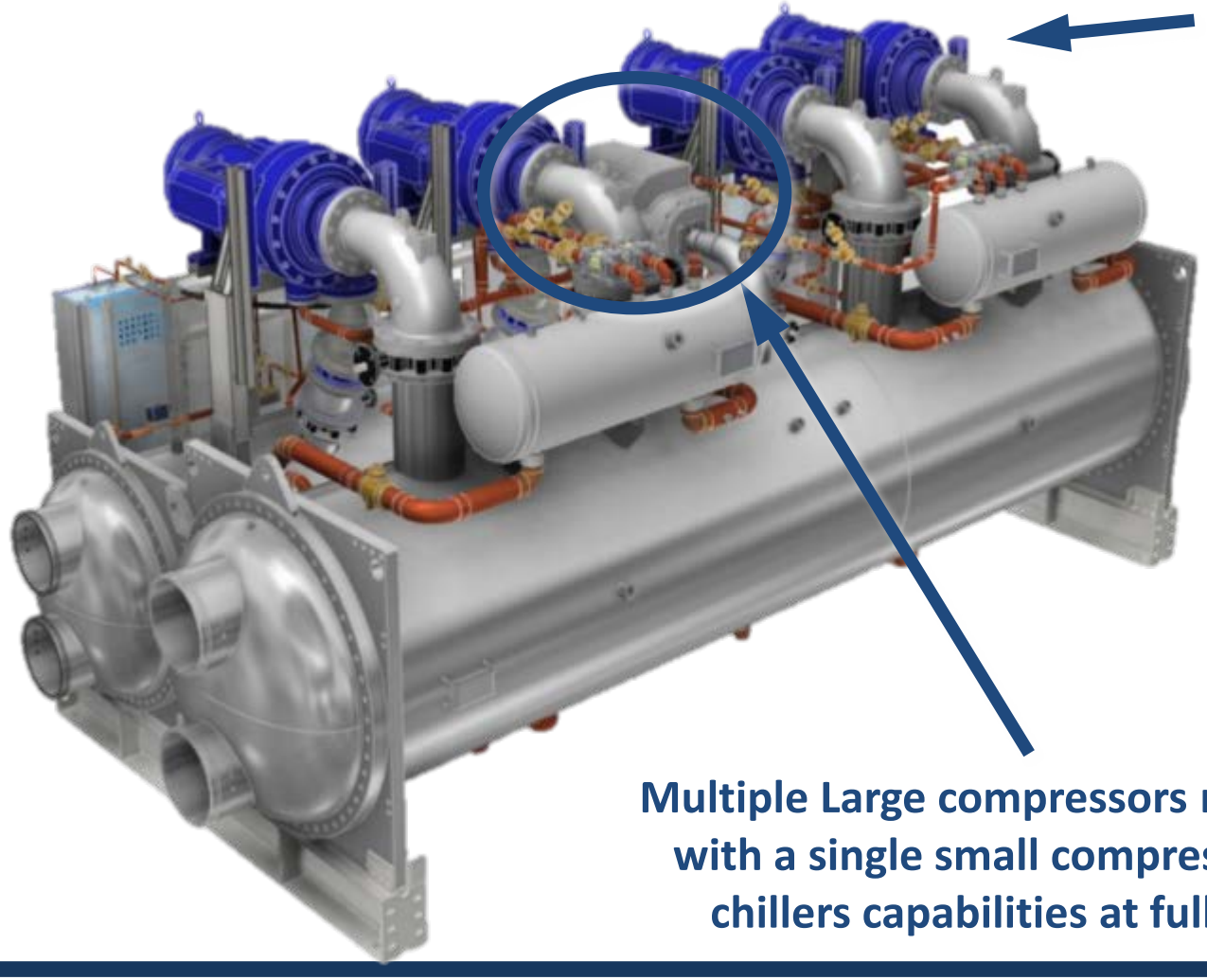
COMPRESSOR

AHRI CERTIFIED™
www.ahridirectory.org
Water-Cooled Chillers
AHRI Standard 550/590
C

SMARDT

Water Cooled V-Class “Pony Express”

500-2500tonR(1230-8,800kWr)



2…7 compressors

Multiple Large compressors running in parallel with a single small compressor extends the chillers capabilities at full and part load

TURBOCOR VTT

COMPRESSOR

TURBOCOR TT

COMPRESSOR

SMARDT

Smardt Water Cooled Split Chillers

120-700tonR(400-2500kWr)

Chiller can be divided in half to allow for easy site access

TURBOCOR VTT

COMPRESSOR

TURBOCOR TT

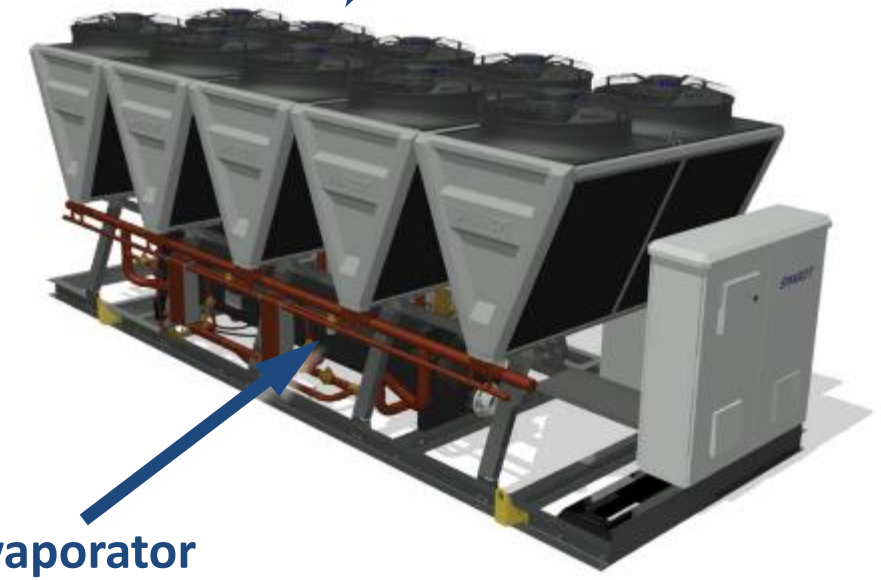
COMPRESSOR

AHRI CERTIFIED™
www.ahridirectory.org
Water-Cooled Chillers
AHRI Standard 550/590
C

SMARDT

Smardt Air Cooled Chillers (T^A-Class)

60-440TR (200-1540kWr)



TURBOCOR TT

COMPRESSOR

AHRI CERTIFIED™
www.ahridirectory.org
Air-Cooled Chillers
AHRI Standard 550/590
C

SMARDT

Smardt Evaporatively Cooled Chillers (E-Class)

60-360TR (200-1260kWr)

Condenser fitted with
EC-fans as standard

Control cabinet

1…3 compressors

Flooded Shell and
Tube Evaporator

TURBOCOR TT

COMPRESSOR

SMARDT

Smardt Product Range Summary

E-Class Chiller
60 - 300RT

AHRI CERTIFIED™
www.ahridirectory.org

T^A-Class
Aircooled Chiller
60 - 450RT

The Largest Chiller Capacity Range – All Certified by AHRI

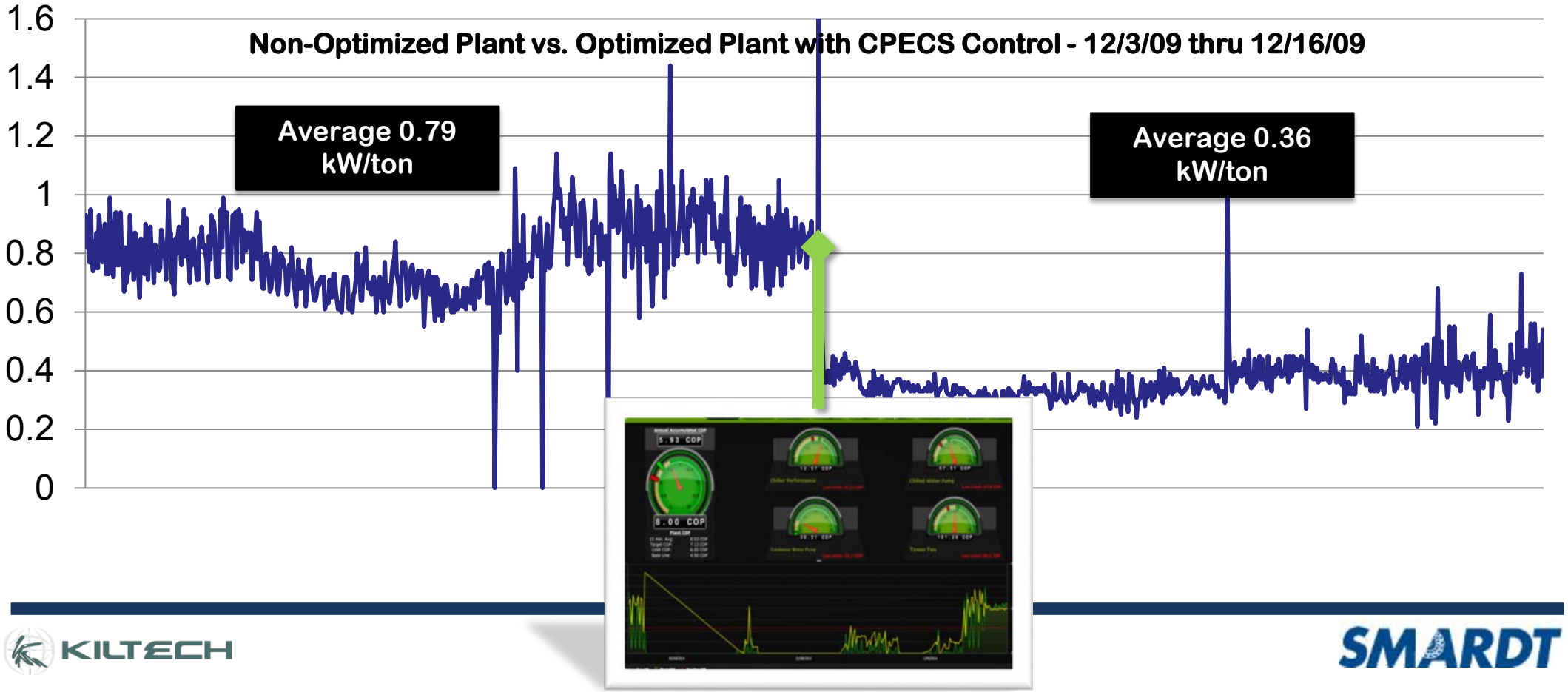
T^W-Class Watercooled Chiller 60 - 1200RT

V-Class Watercooled Chiller 350 - 2500RT

60 500 1000 1500 2000 2500 RTons

Plant Optimisation - CPECS

- CPECS – Central Plant Energy Control System
  - Total Cooling Plant Optimisation for enhanced savings



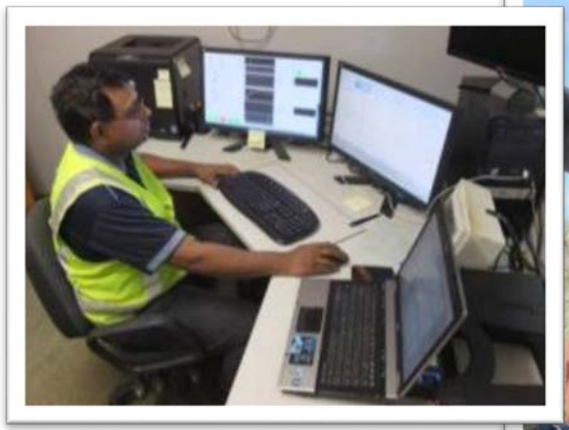
KILTECH

SMARDT

State of the Art Test Facilities

AHRI Approved Chiller Test Facilities

- Melbourne, Montreal, & Guangzhou
- Ultimate quality assurance
- Fully automated



AHRI CERTIFIED™
www.ahridirectory.org

SMARDT

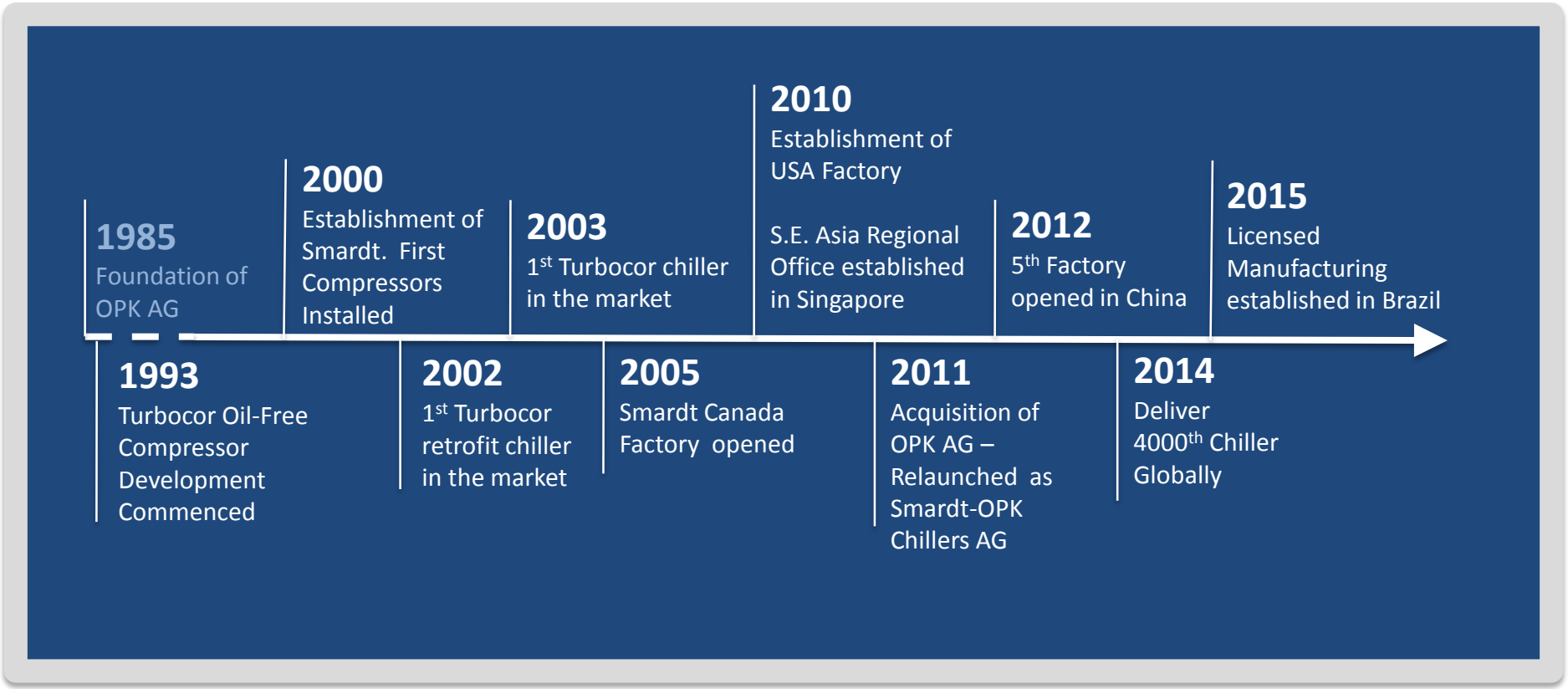
An Industry Milestone in Chiller Efficiencies

- In 2002 Smardt revolutionised the Chiller industry releasing the world's first oil-free high efficiency chillers.
- This was a significant milestone as typically the chiller industry is extremely slow in developing new technologies to advance chiller efficiencies
  - Centrifugal Compressors – 1922
  - Screw Compressors – 1967
  - VSD Prototypes – 1979
  - **Oil-Free Centrifugal Compressors - 2002**
- Minor Efficiency enhancements in the last 50 years:
  - Heat Exchanger improvements – enhanced tubes
  - Expansion Devices – EXVs replacing TXVs
  - Motor Efficiencies Improved
  - Economisers Added to multi stage compressors
  - Compressor Manufacturing Refinements

SMARDT

Historically Proven

Smardt's High Efficiency Oil-Free Chillers have been in Operation for 15 years.



Smardt now has approximately 5,000 oil-free chillers installed worldwide, and there are approximately 50,000 oil-free compressors installed globally.

SMARDT

Question:

Why should you choose a Smardt oil-free chiller?

Answer:

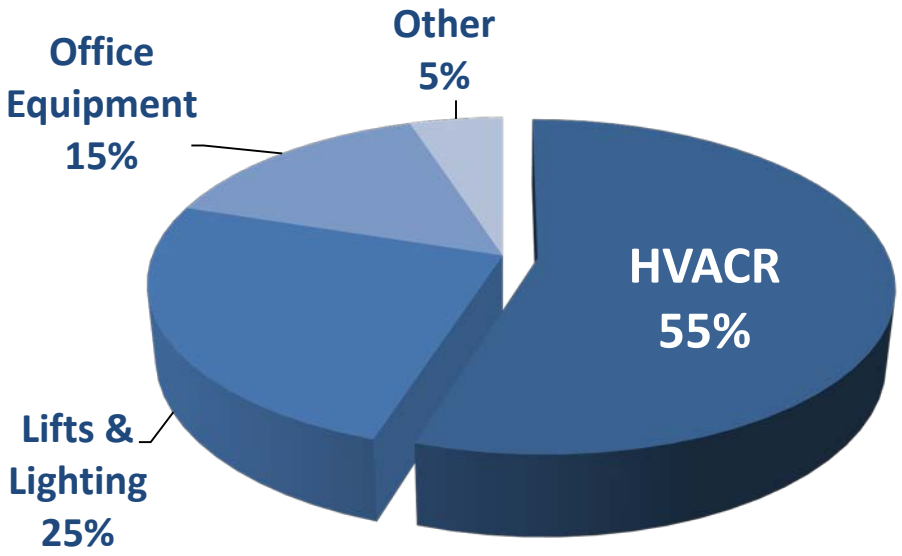
Smardt's oil-free Chillers provide the highest efficiencies and the lowest cost of ownership, whilst also increasing reliability by eliminating conventional issues.

SMARDT

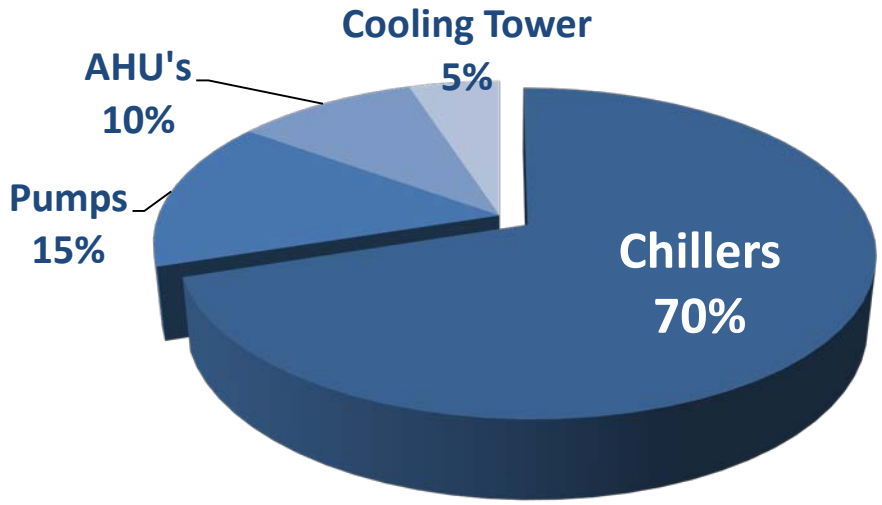
Providing the Highest Efficiencies

- HVACR is the major source of energy consumption in commercial properties
- The Chillers use the majority of the energy consumed by the HVAC system.
- High Efficiency Chillers will therefore have the greatest impact in reducing a buildings power consumption, and as such chillers need to be efficient at all operating points, rather than just at 100% of capacity which is where they are conventionally assessed.

Typical Commercial Energy Usage

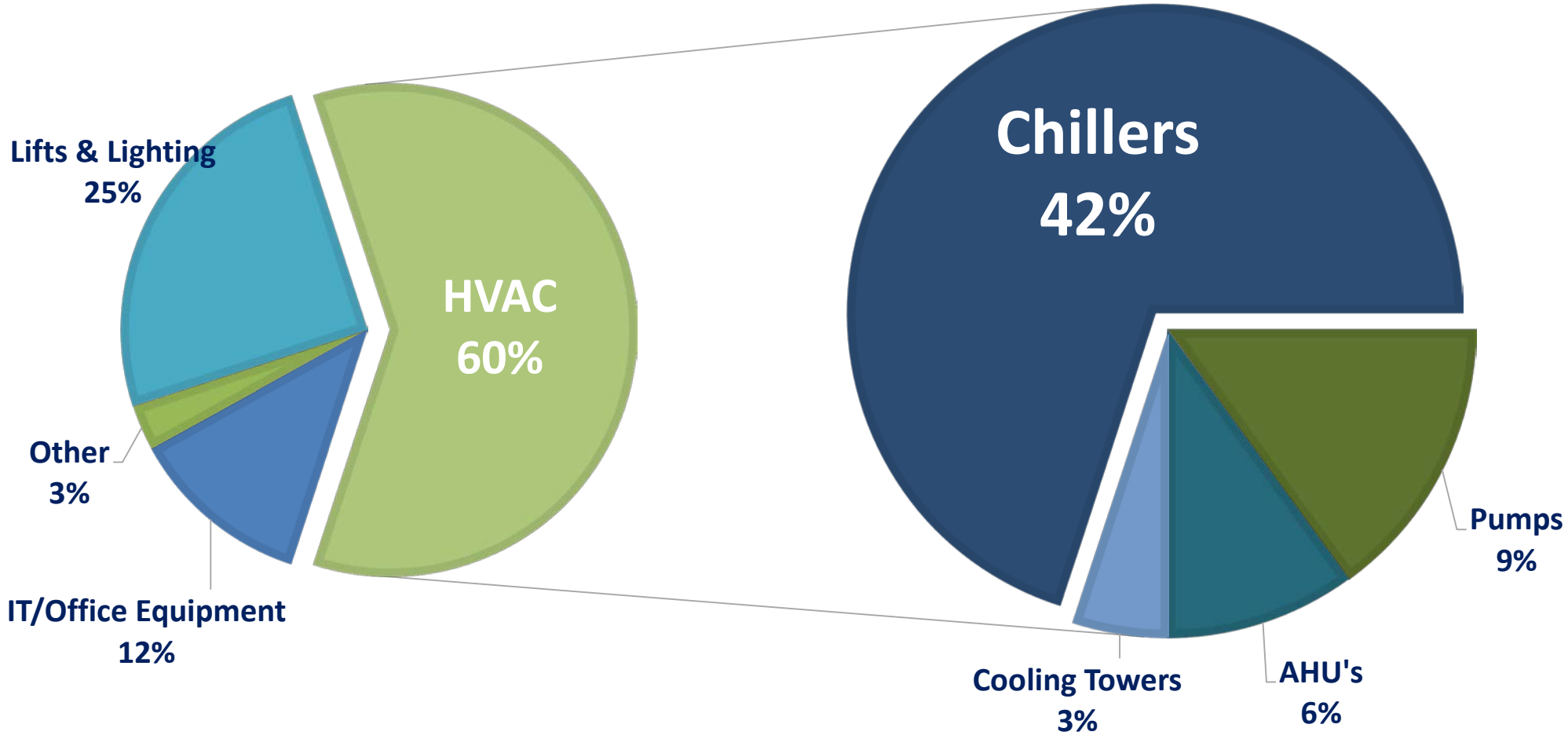


Typical HVAC Energy Usage



SMARDT

TYPICAL COMMERCIAL BUILDING ENERGY USAGE



Chillers consume approximately 30-50% of the total buildings power

SMARDT

Positive Financial Impact

- Chillers are an extremely significant cost which directly affects profitability.
- Upgrading to high efficiency Smardt Chillers will have a visible impact on the bottom line.

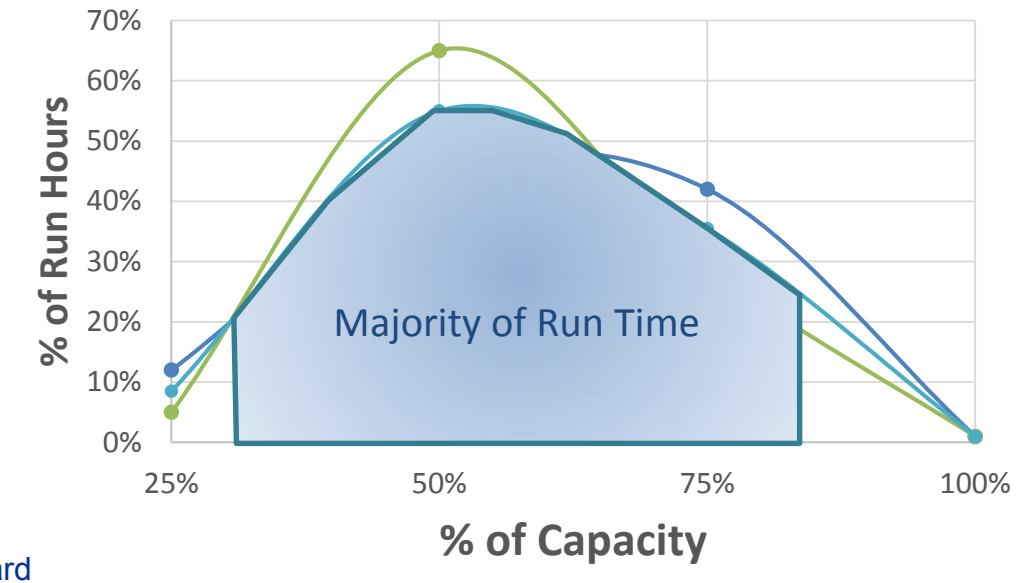
SMARDT

IPLV - Integrated Part Load Values

Weighted Average Values – AHRI & MS1525

- IPLV is an industry accepted rating standard developed by AHRI to provide a weighted efficiency of a chiller that reflects an operational load profile, in contrast to comparing chiller efficiencies at 100% load, which only occurs 1% of the year.
- The Malaysia Standard provides a similar load profile curve even without the condenser relief expected with AHRI

% load	AHRI Standard	Malaysia Standard
100%	1%	1%
75%	42%	29%
50%	45%	65%
25%	12%	5%



AHRI Standard 550/590-98 MS 1525:2014 Standard

SMARDT

Smardt-Chiller - Efficiency

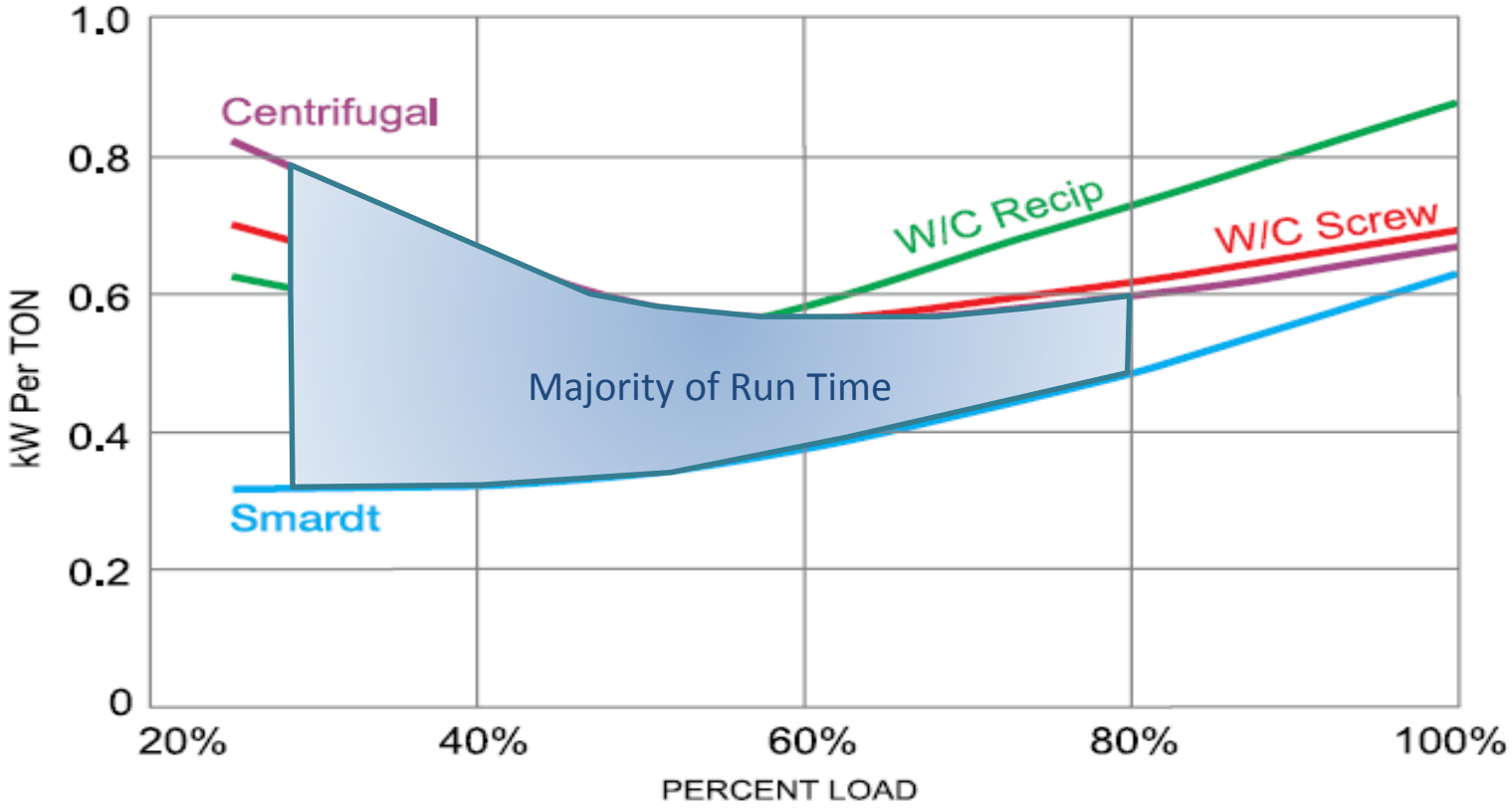
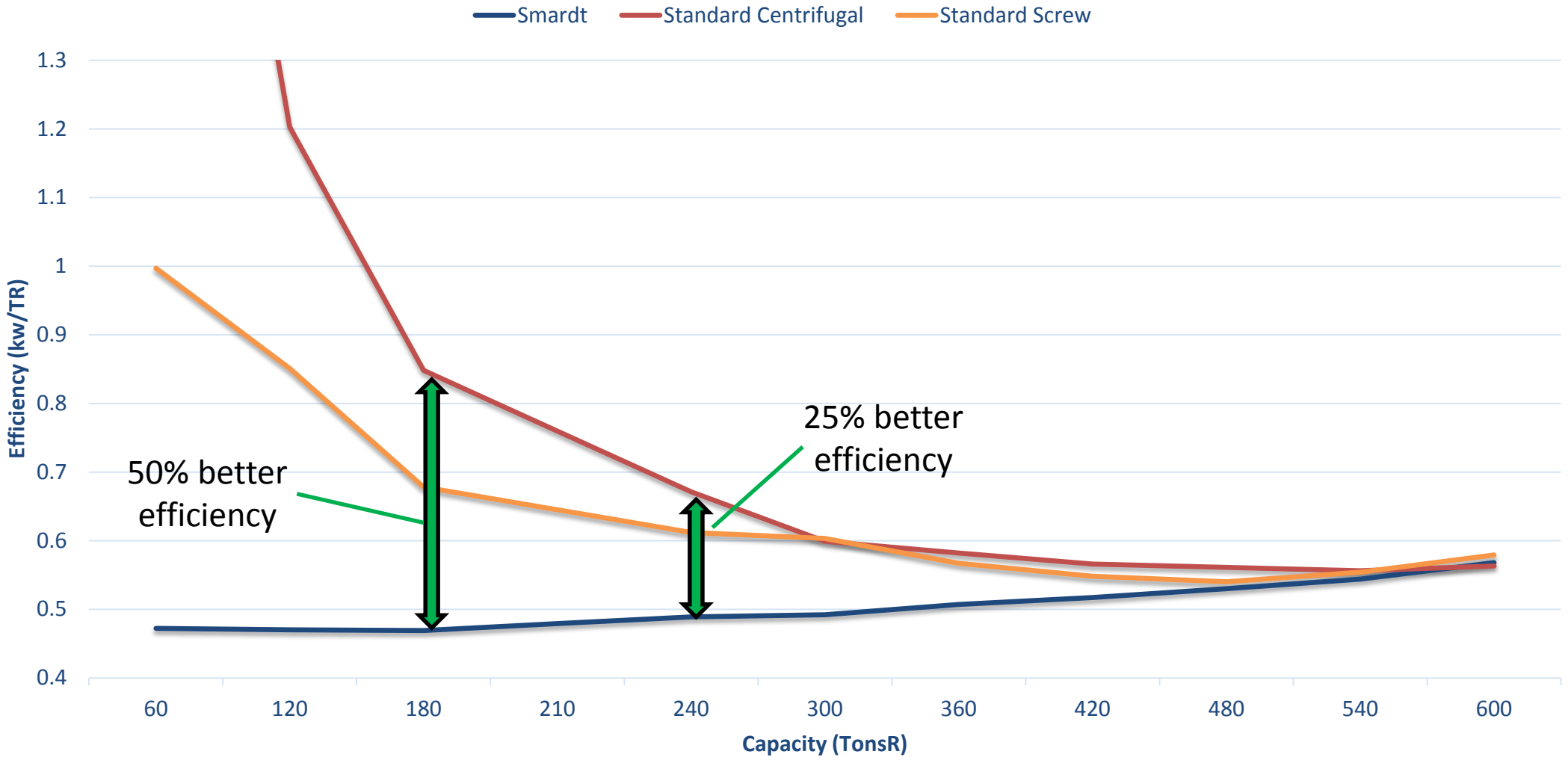


Diagram: Comparison uses generic industry performance data for 250TR water-cooled chillers (data source AHRI) with cooling tower relief

SMARDT

Smardt vs. Centrifugal vs. Screw

Constant Condenser Water Temp (6.7C/ 12.2C and 29.5C/35C, based on 600RT)



SMARDT

Conventional Chiller Issues – Outdated Compressor Technology

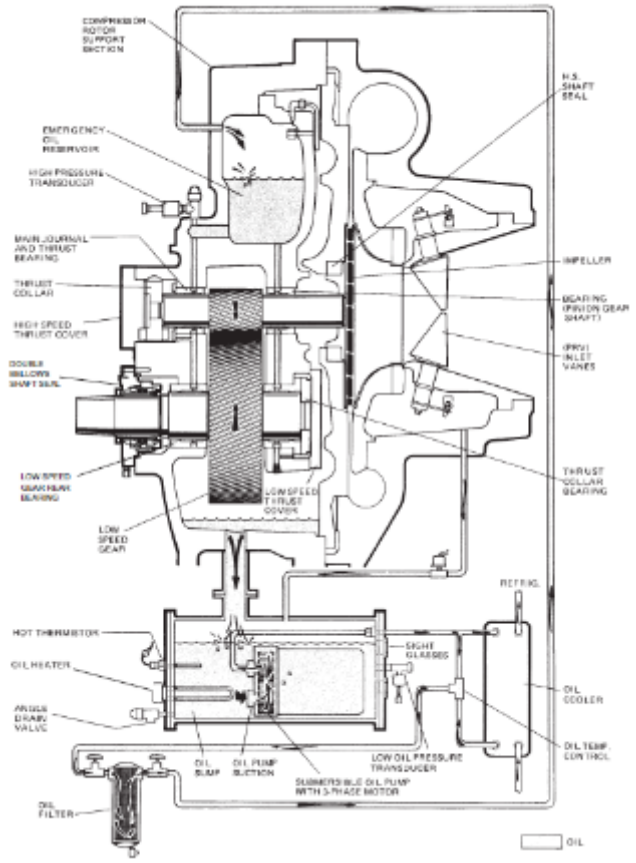
- Conventional Compressors reliance on oil results in;
  - Increased energy consumption
  - Inability to accurately match operating conditions
  - Increased operating costs over a chillers lifetime


1922 – First Centrifugal Chiller

- Modern chillers still have the same historically fundamental issues:
  - VSDs reduced power consumption, but increases oil-related issues, particularly at part load.
  - Noise and Vibration are still an issue
  - High Start Up currents remain a problem
  - Size and Weight of Components poses service and installation difficulties.

SMARDT

Complex Oil Management = Chiller Issues



Oil Management of a Conventional Centrifugal Compressor

- Conventional Chillers Require Oil Management
- Oil Management Adds Complexity
  - Gears - Friction
  - Oil Sump
  - Emergency oil reservoir
  - Oil cooler
  - Oil filter
  - Oil heater
  - Oil Differential pressure switch
- Additional Complexity Leads to Failures
- Ongoing Operating Costs related to Oil
  - Oil Sampling, Replacement, Top Ups, Disposal
  - Filters/Dryers/Sensors needing replacement

The Affect of Oil on Performance

Heat exchanger efficiency drops because of oil slick / coating

Refrigerant 6°C

Refrigerant 4°C

<u>A brand new heat exchanger</u>

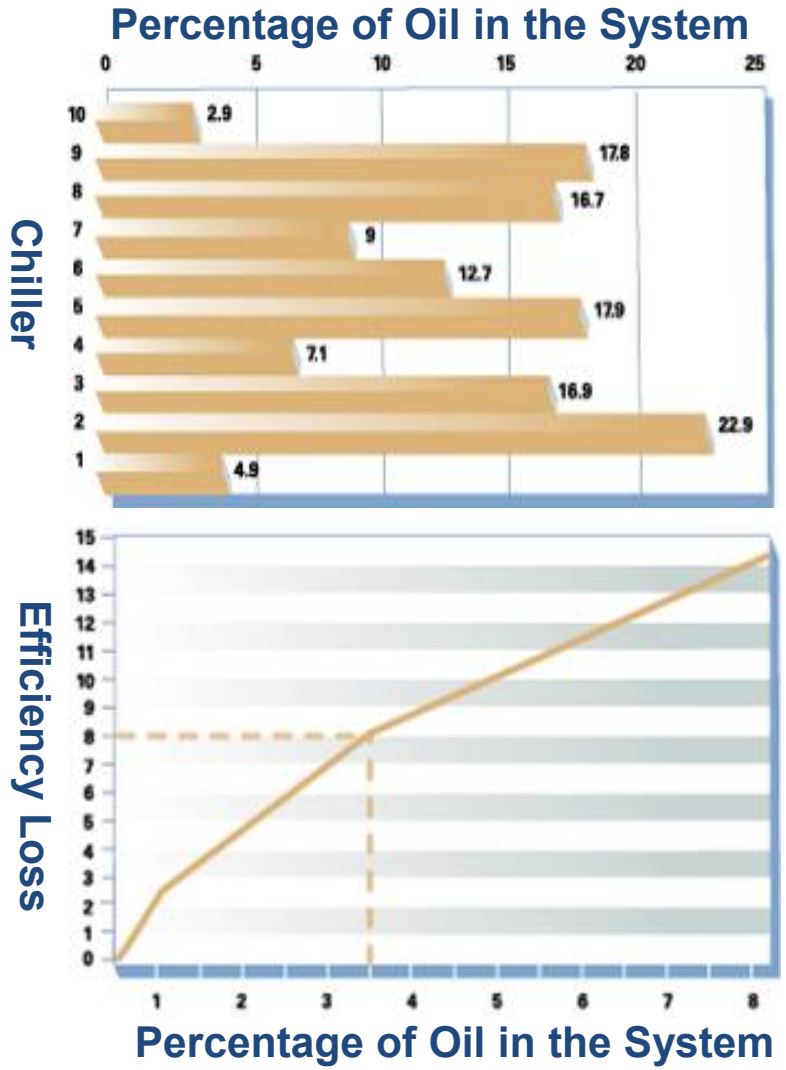
- A healthy approach of 1°C

<u>The effect of prolonged oil in the system</u>

- Accumulation of oil increase the approach to 3°C
- Higher approach reduces Chiller Capacity and Performance

SMARDT

The Effects of Oil



- The top ASHRAE study determined the average quantity of oil as a percentage in older chillers.
  The average is approx. 13%.
- The bottom study equated presence of oil to efficiency loss.
  3.5% of oil = 8% efficiency loss.
- **Smardt Chillers have been designed around the oil-free Turbocor compressor and as such do not use any oil.**

SMARDT

The In-Direct Cost of Oil

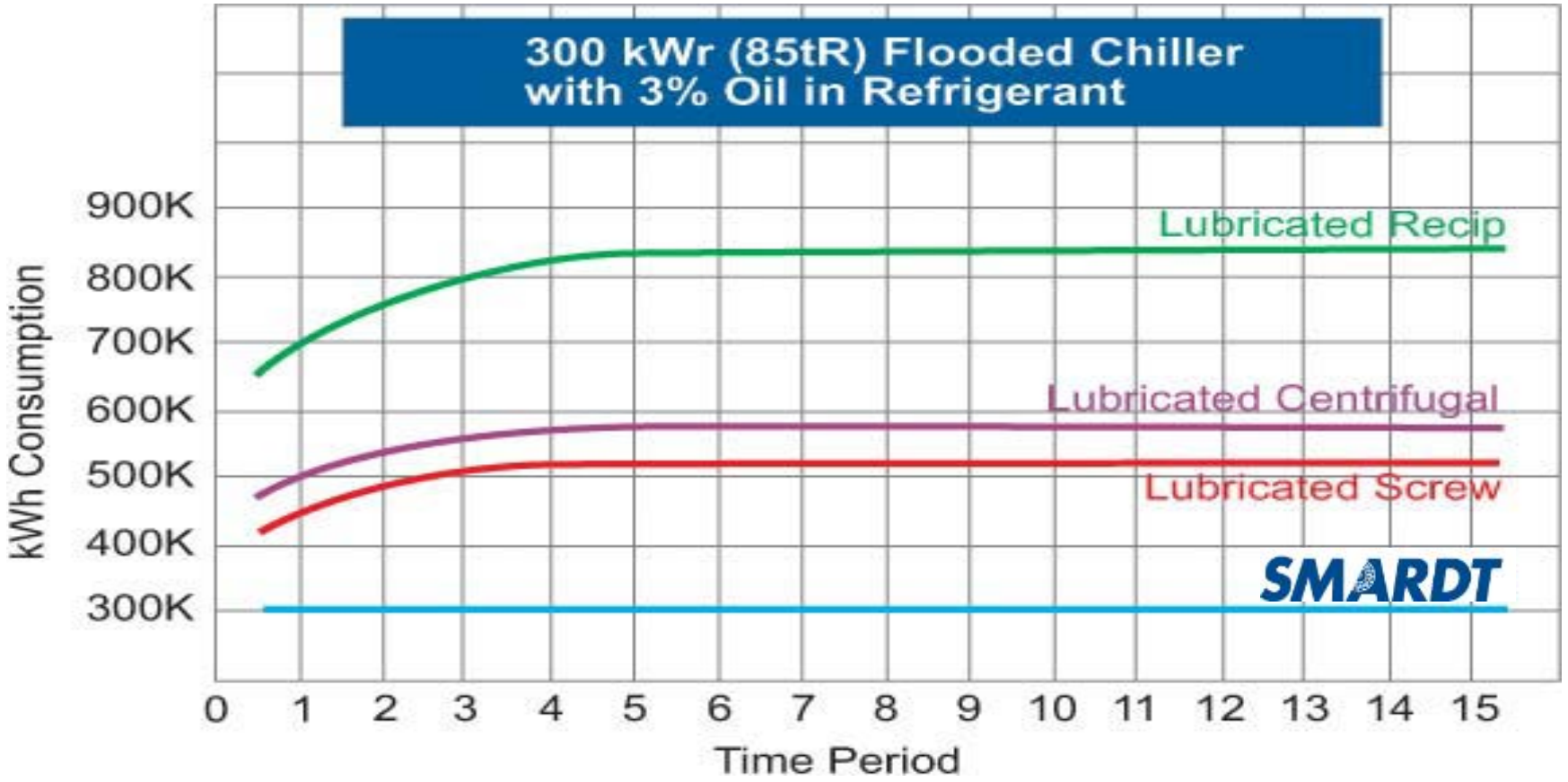
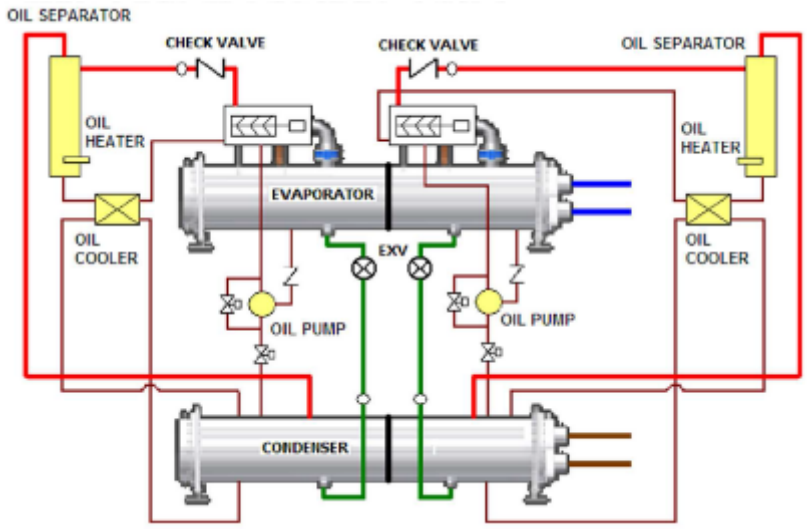


Diagram: as this comparative study showed, over 20% of lubricated chiller's operating efficiency is routinely lost in the early years as a result of oil clogging of heat transfer surfaces.

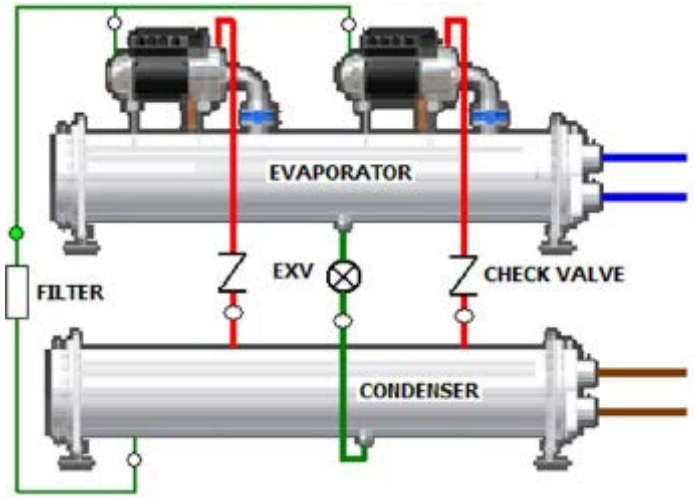
100%
OIL FREE

SMARDT

Reduction in Failures through Simplified Piping



Oil Reliant Chiller



Oil-Free Chiller

- More Complexity = Increased Failures
- Guaranteeing adequate oil-return is still a challenge
- Removing the need for oil eliminates the challenge.

100%
OIL FREE

SMARDT

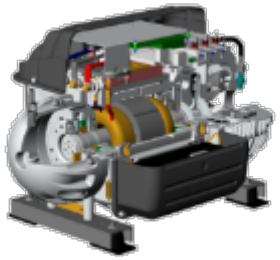
Reduced Maintenance Requirements

- Over 70% of chiller field costs are due to problems with compressor oil return (Sources: Emerson Electric, AHRI)
- This compressor is **virtually maintenance free**, as the Magnetic Bearings have eliminated wearing surfaces – irrespective of the running hours on the compressor.
- Unique anti corrosion options available on AC and WC
- Oil-Free chillers have less maintenance as they do not contain any oil, or associated hardware.
  - No Oil Changes or Oil Filter replacements
  - No Oil and Refrigerant Testing Required
  - No Filter Dryer Replacements Required
  - No Oil Migration at Part Load
  - No Oil Fouling
- Reported reductions in Maintenance costs of around 50%.

SMARDT

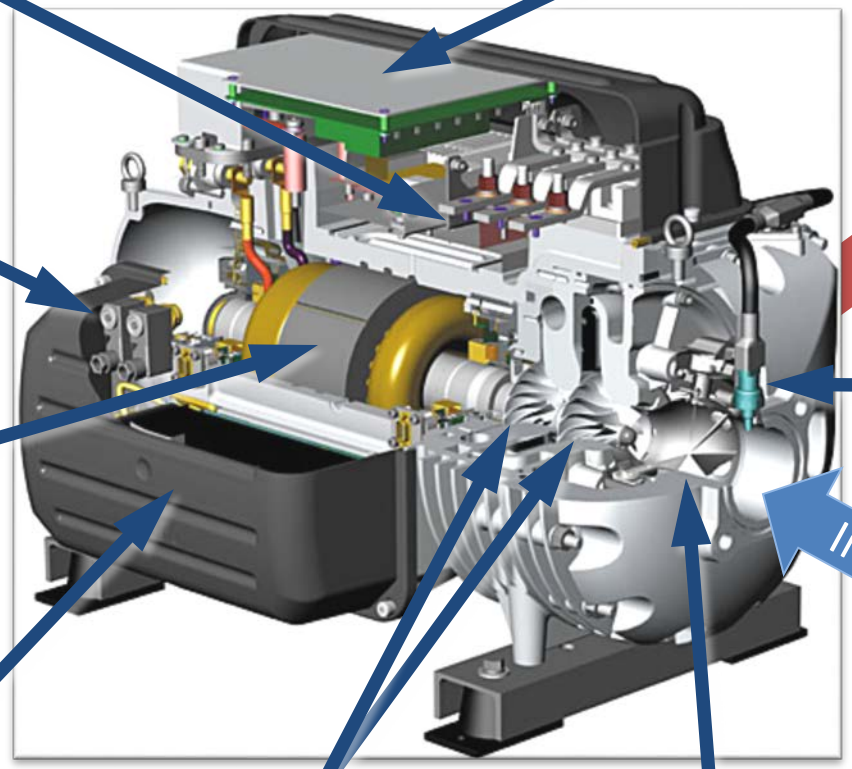
The Smardt-er Alternative - One Solution

- A Magnetic Bearing, Oil-Free, Centrifugal Compressor.
- Designed from the “ground up” to address the issues and the need for environmental responsibility.
- This revolutionary compressor provides:
  - Increased Energy Efficiency
  - Elimination of Oil Related Issues
  - Noise Reductions
  - Reduced Maintenance Requirements
  - Weight and space reductions
  - Increased Chiller Capabilities



SMARDT

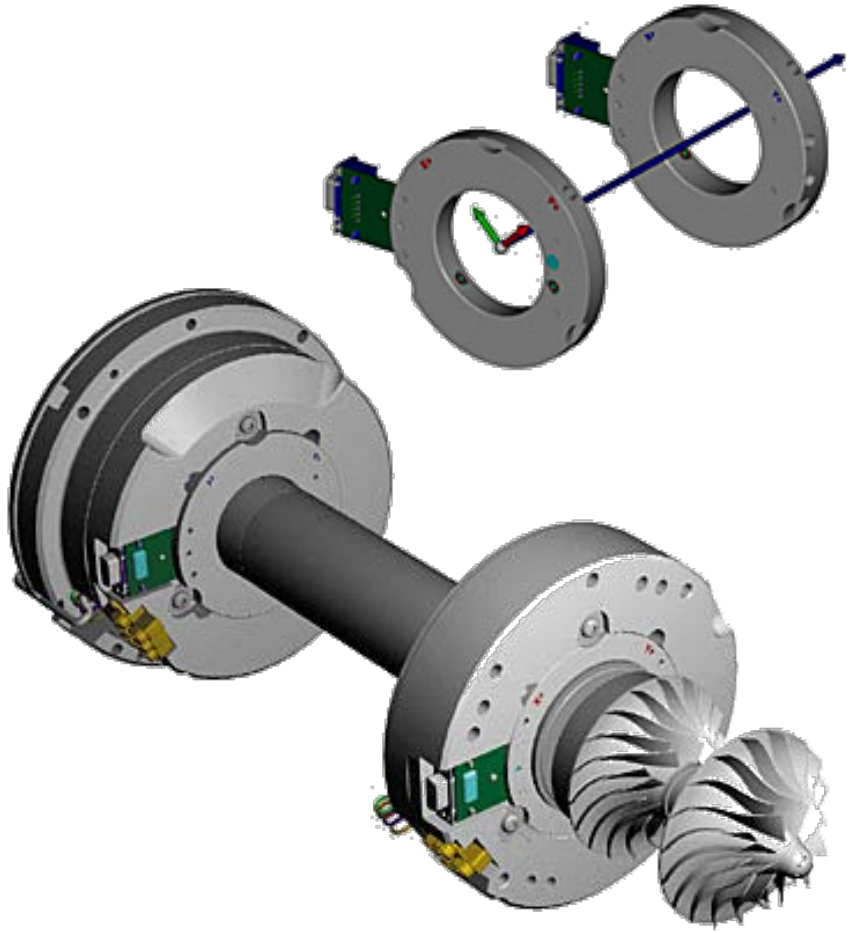
Revolutionary compressor technology



SMARDT

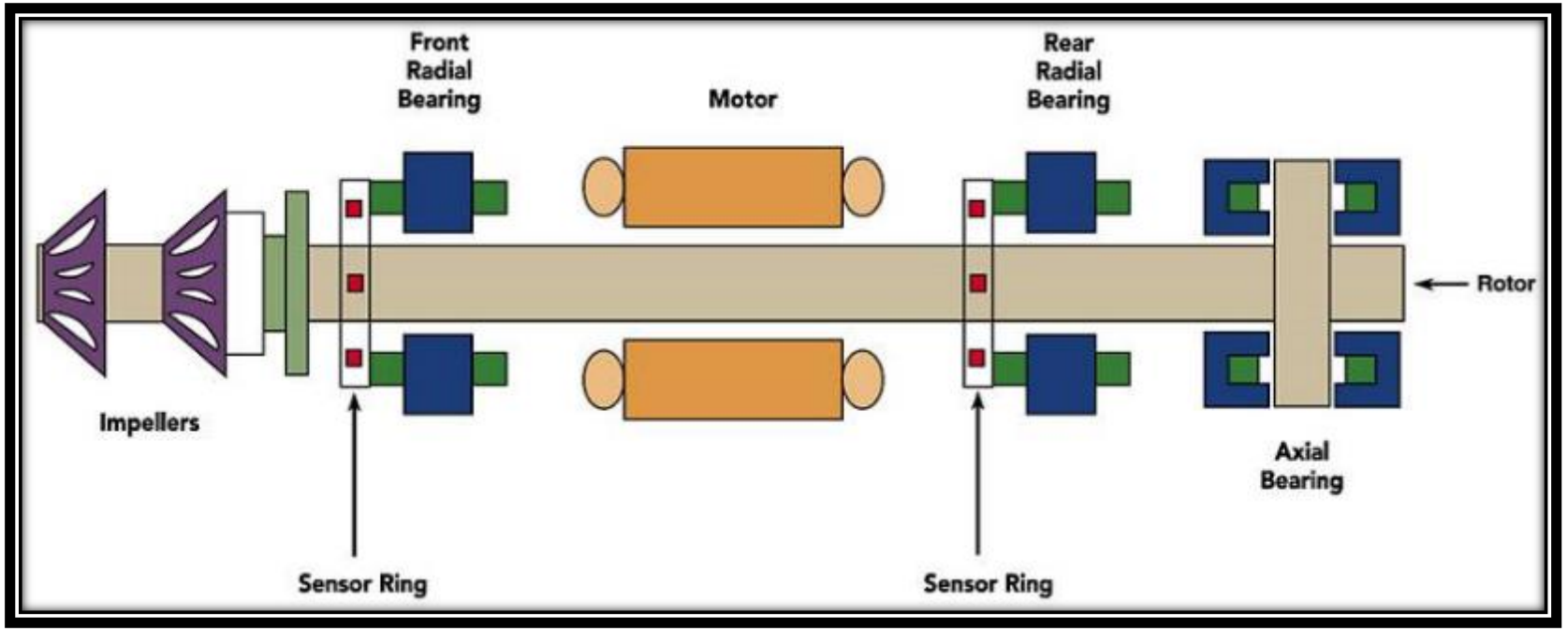
Key Technologies - Magnetic Bearings

- Magnetic Bearings
  - Eliminate high mechanical friction losses
  - Increase equipment life through elimination of wear surfaces
  - Eliminate oil-related heat transfer losses
  - Eliminate complex oil management systems (controls and hardware)



SMARDT

Magnetic Bearing System

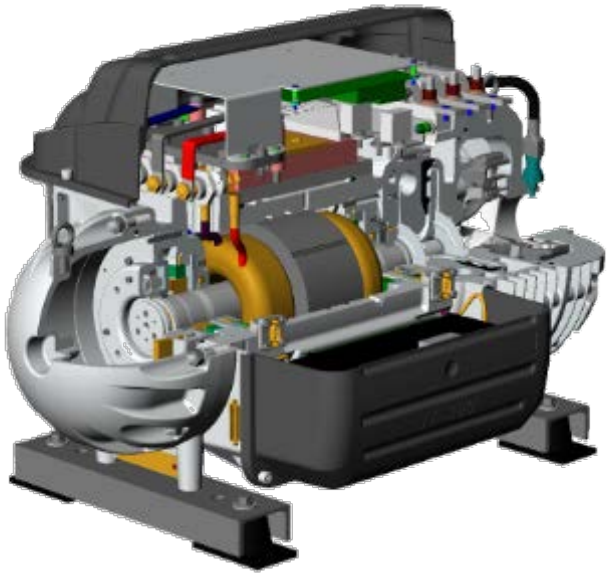


- Active re-centering of the shaft at 100,000/second.
- Movements measured and actively adjusted in mere microns.
- Shaft kept controlled and centered to within 7micron. (1/10th of the diameter of a human hair.)
- Back up bearings are included to prevent damage to the shaft should a control or bearing failure occur.

SMARDT

Power Outage?

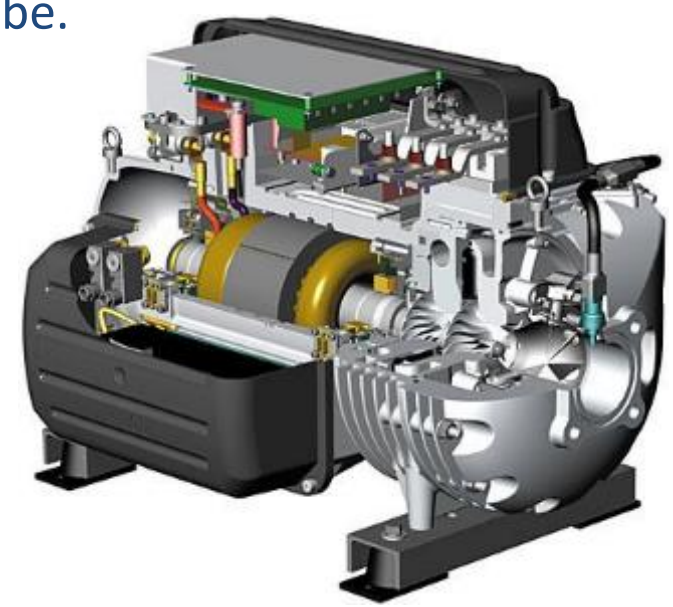
- Within 0.5 of a micro-second, the motor becomes a generator, feeding power to the various controls and bearing actuators during a controlled coast-down.
- The onboard capacitors have enough power to fully support the bearing system during the switch from motor to generator mode.
- After the compressor comes to a complete stop, the rotor de-levitates normally onto touchdown bearings.
- Smardt Chillers can be rapidly restarted without concern as there is almost no inrush current to the motor and there are no oil based constraints.



SMARDT

Variable Speed Drive

- The Compressors speed adjusts automatically to match the load and current operating conditions so that optimum efficiency is gained.
- We vary the speed for most of our capacity control, and only use the Inlet Guide Vanes when beyond the range of solely relying on speed.
- The slower the compressors, the greater the efficiency. As speeds is reduced, energy consumption is reduced by the cube.
  - Speed $\propto$ Energy^3
- Speed range of 12,000 – 45,000 r.p.m.



SMARDT

Simplest Centrifugal Compressor

- This oil-free compressor has essentially only **a single moving part**
- The compressor's high speed capability, reduces its overall size
- Centrifugals offer the highest aerodynamic compression efficiency at full load and with an integrated VSD, they also provide the best part load efficiencies

SMARDT

Smallest Centrifugal Compressor

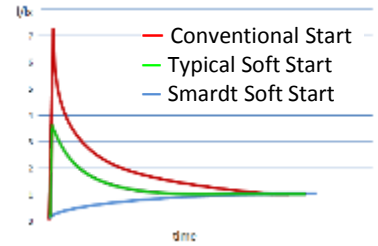
- Multiple Compressor Capacity Models:
  - 60-170TonR / 200-600kWR
- All Compressor Models are the same physical size:
  - Dimensions(cm): 90 x 60 x 75
- Extremely light weight,
  - Less than 140kg

- An innovative, permanent magnet, brushless DC motor which helps to reduce the size of the compressor:
- The motor is 160hp but is the size of a conventional 1hp induction motor.
- Compare the motors in the picture:
  - Rear = Turbocor 160HP motor
  - Front = conventional 120HP motor

SMARDT

Enhanced Operating Characteristics

- Provides the Lowest Chiller Sound Levels
  - Turbocor Compressor at 72 dBa at 1 meter with no sound attenuation. Screw compressors are approximately 80 dBa or higher.
- Chiller Vibration is essentially eliminated
  - No spring isolators required.
- True Soft Start – with chillers starting < 2amps.
  - No Soft starters required.
- Ultra Fast Chiller Restarts After Power Failures
  - No oil system to delay a chiller start up.



SMARDT

Part Load Optimisation

- To achieve the best efficiency when operating the chiller, the maximum number of compressors run in parallel.
- This is controlled by propietary logic developed by Smardt and managed by Smardt‘s own chiller controller

SMARDT CONTROLS

SMARDT

Active Redundancy

Peak load at 1800RT
Night load @ 300RT

Conventional oil based chiller with single compressor

1000RT 1000RT

2x 500RT (Standby)

Conventional chiller efficiency
@ 90% load = 0.56 kW/ton

Smardt chiller with multiple compressors

1000RT 1000RT

1000RT (Standby)

Oil-free chiller efficiency
@ 60% load = **0.47kW/ton**
20% saving!

SMARDT

Smardt Chillers – Reliability

Redundancy in HVAC or Process cooling is critical

A compressor issue reduces chiller capacity to 0%

A compressor issue reduces chiller capacity to 75%

Integrated Redundancy

"Integrated redundancy is a design concept that increases operational availability, whilst reducing operating and infrastructure costs…"

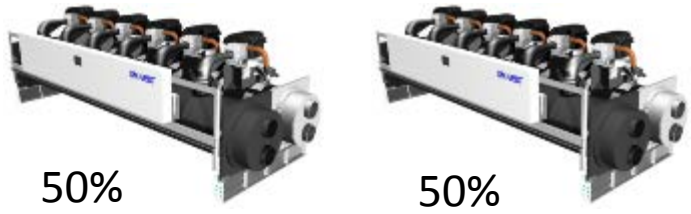
Conventional oil based chiller configuration with single compressor (2000RT+1000RT)

1000RT + 1000RT = 2000RT (N)

500RT + 500RT = 1000RT (+1)

Peak load at 1800RT
Night load @ 300RT

Smardt chiller configuration with multiple compressors (2000RT) (140RT x 14)



1000RT + 1000RT = 2000RT (N)

SMARDT

Integrated Redundancy

Conventional oil based chiller with single compressor

Total capacity = 2000RT + 1000RT

Chiller 1 | Chiller 2 | Standby Chillers

Peak load at 1800RT
Night load @ 300RT

Smardt chiller with multiple compressors

Total capacity = 2000RT

Chiller 1

Chiller 2

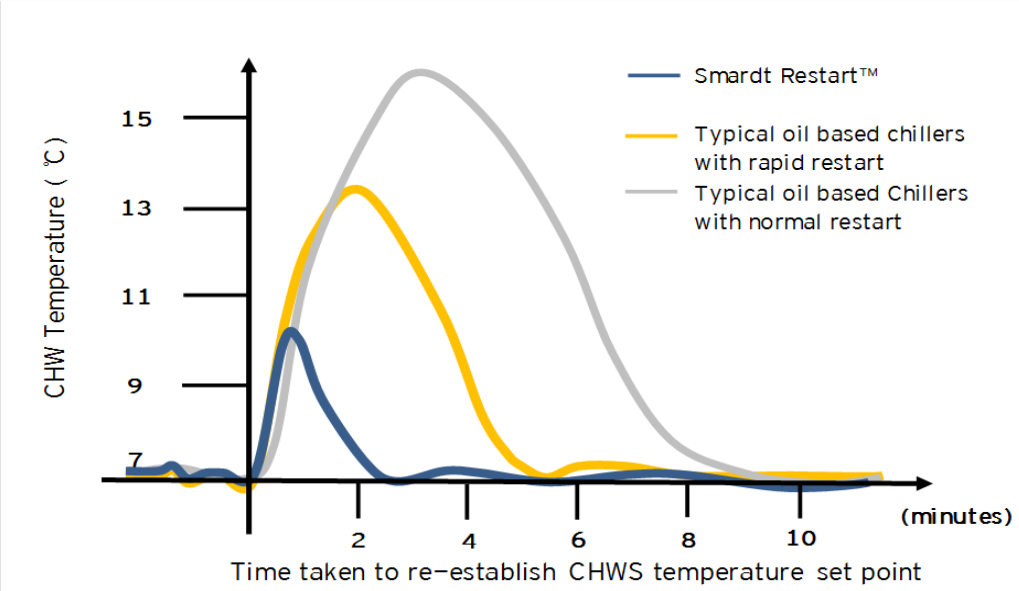
Each compressor is about 7%

2000RT * 93% = **1860RT**

- Low initial cost
- Low maintenance cost
- Space saving
- No fluctuation of chiller water supply temperature

SMARDT

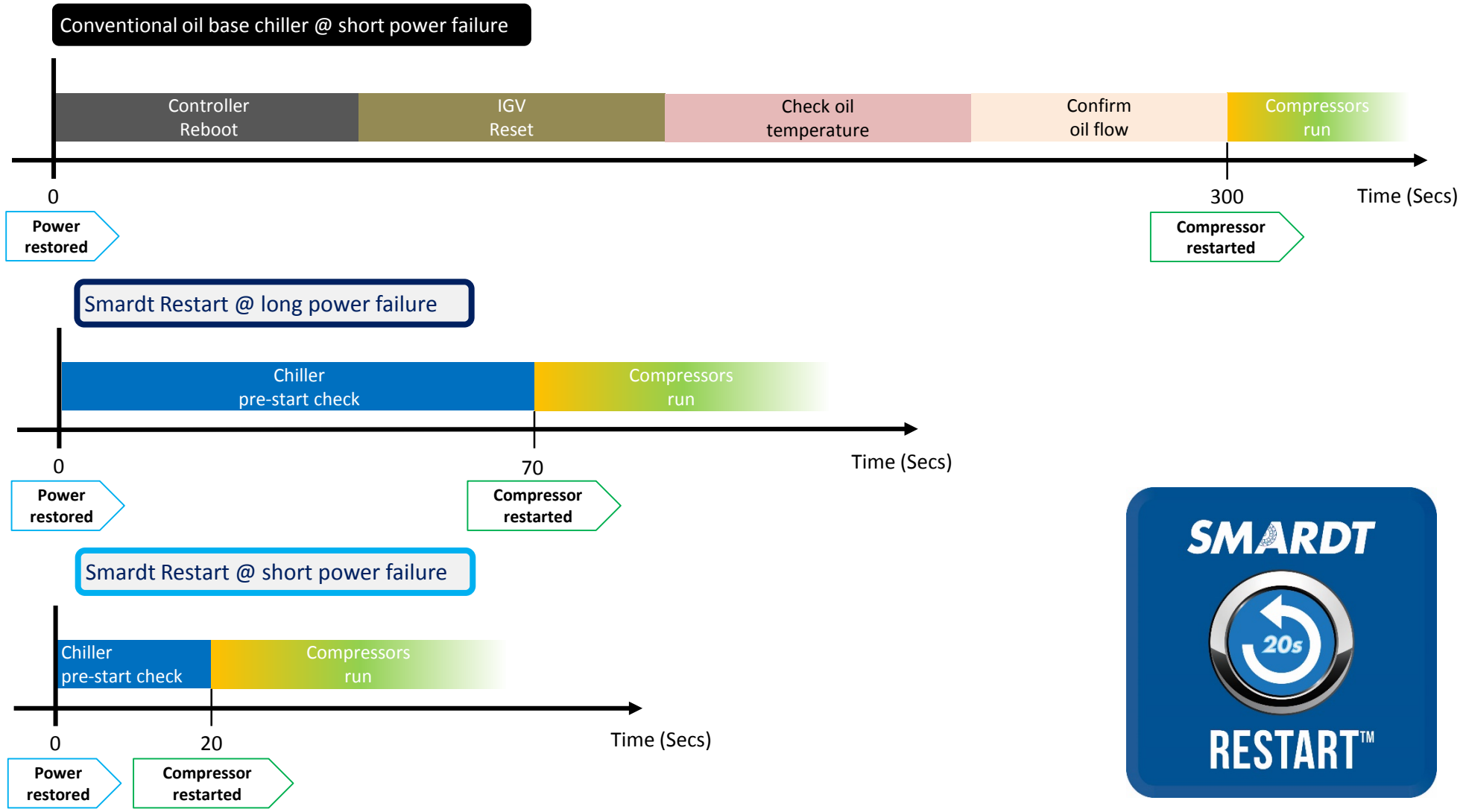
Critical Cooling use Smardt Restart™



- The Fastest Chiller Restart in the industry (<20seconds)
- Fastest Chilled Water Temperature Recovery
- Reduced Thermal Storage Requirements

SMARDT 20s RESTART™

Smardt Restart



SMARDT 20s RESTART™

SMARDT

Smardt Restart Advantages

- No oil related pressure and temperature checks, safeties or timers.
- No mechanical stress on compressors during restart
- No thermal stress on motor during multiple restarts, and no power surges, < 2 Amps starting current
- No hours based limitation on number of restarts (open drive compressors should only be restarted twice an hour)
- No loss of communications with Chiller controller.
- Fast chilled water recovery with Smardt's proprietary programme - eliminate the need for additional thermal storage

Building Integration & Service Convenience

- Full Integration with BMS via HLI
- Descriptive Alarms and Faults
- Real Time Trending

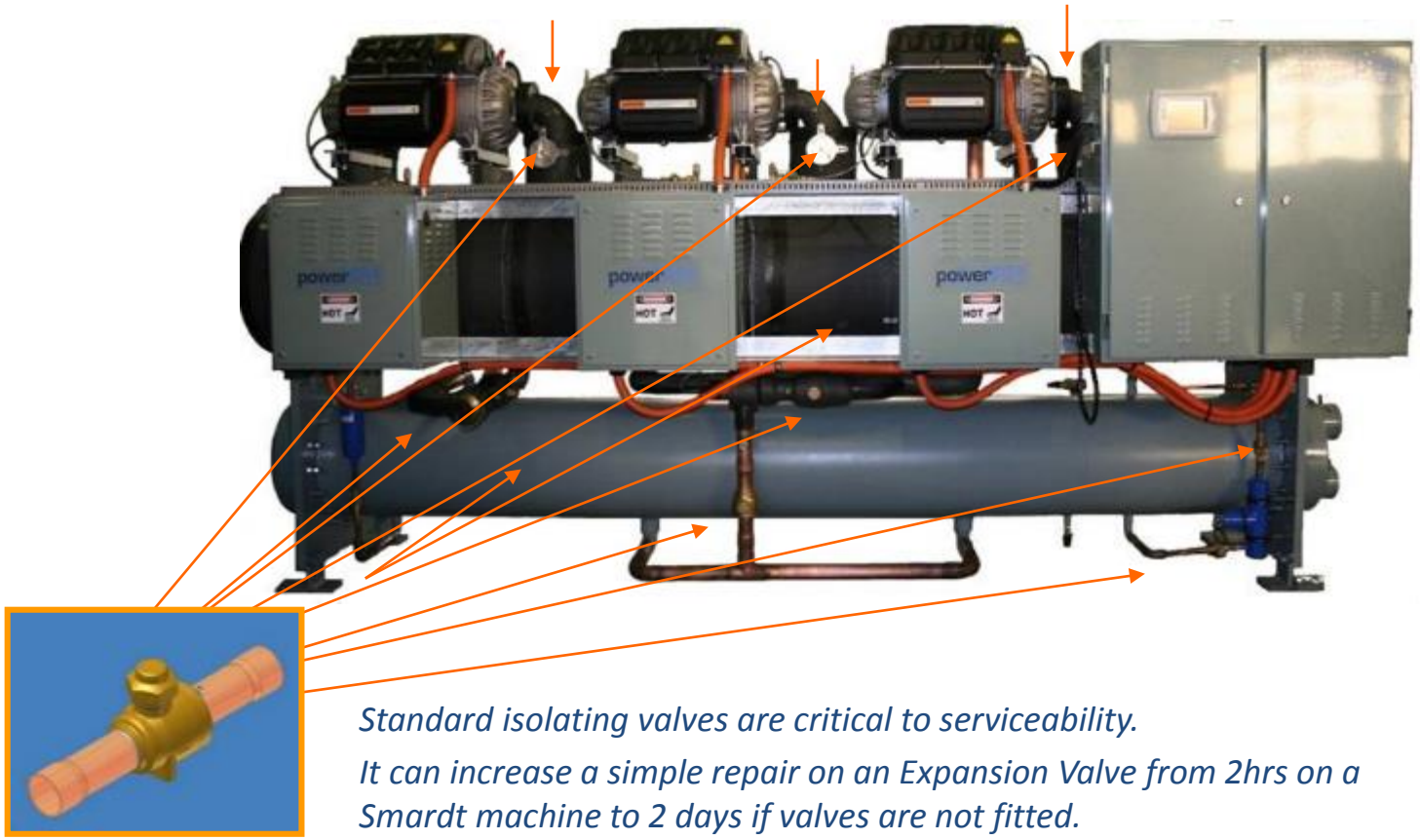
- Menu Driven Interface
- Building Operator Friendly
- Self Diagnosis and Fault Reporting

SMARDT CONTROLS

SMARDT

Service Convenience

*Smardt fit an average of 10 isolating valves on every part of the refrigerant circuit as a standard on water **and** aircooled chillers*



Standard isolating valves are critical to serviceability.

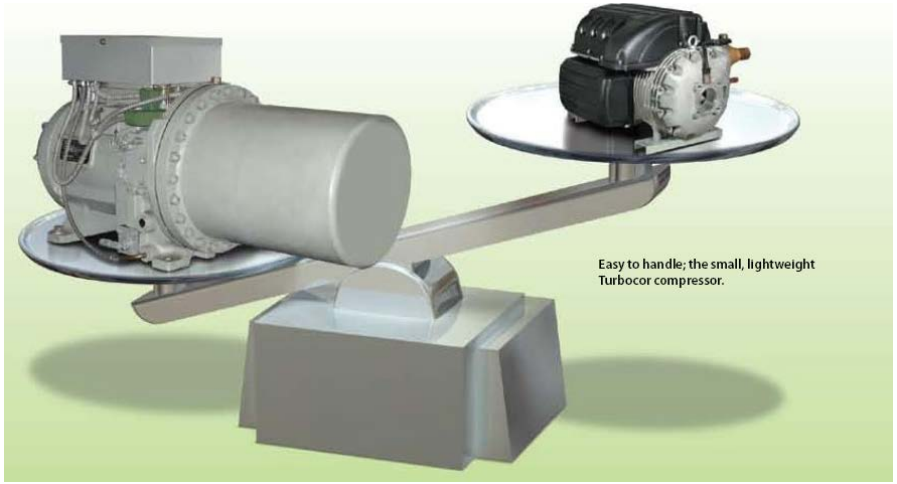
It can increase a simple repair on an Expansion Valve from 2hrs on a Smardt machine to 2 days if valves are not fitted.

REDUCED MAINTENANCE

SMARDT

Ease of Service

- There is no need to stop the chiller to service a compressor.
- Each compressor can be individually isolated.
- Each operational component can also be isolated individually.
- The convenience of the multiple isolation valves allows parts to be repaired or replaced without the costly and time consuming process of removing refrigerant from the chiller.



SMARDT

Increased Flexibility in Plant Design

- Smardt's Oil-Free Variable Speed Chillers provide additional flexibility in plant designs:
  - Large capacity range: Efficiently Unload to approx. 10%
  - Well suited to Variable Primary Flow Plant Designs, with 50% or better turndown on chilled water typically available.
  - Widest Range of Chilled Water Temperatures – some currently operating with 20C Supply Chilled Water Temps
  - Ability to operate even with low condenser water temperatures.

➔ Results in not only the most efficient chiller, but also the most efficient, and flexible chiller plant

SMARDT

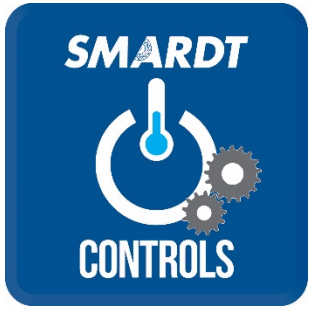
Why choose Smardt over other oil-free chillers?

- Smardt is the foremost expert in oil-free chillers
  - The most experience globally - the 1st OEM with oil-free chillers.
  - The largest installed base of oil-free chillers in the world.
  - Smardt is the only OEM dedicated 100% to oil-free chillers.
- Worldwide Expertise and Support
- Smardt has the greatest flexibility
  - The most diverse range of oil-free chillers, ensuring we can meet your design requirements.
- Smardt is a Diamond DTC Partner
  - Smardt is Danfoss Turbocor's Leading OEM Partner, in total compressor sales, and lowest warranty costs

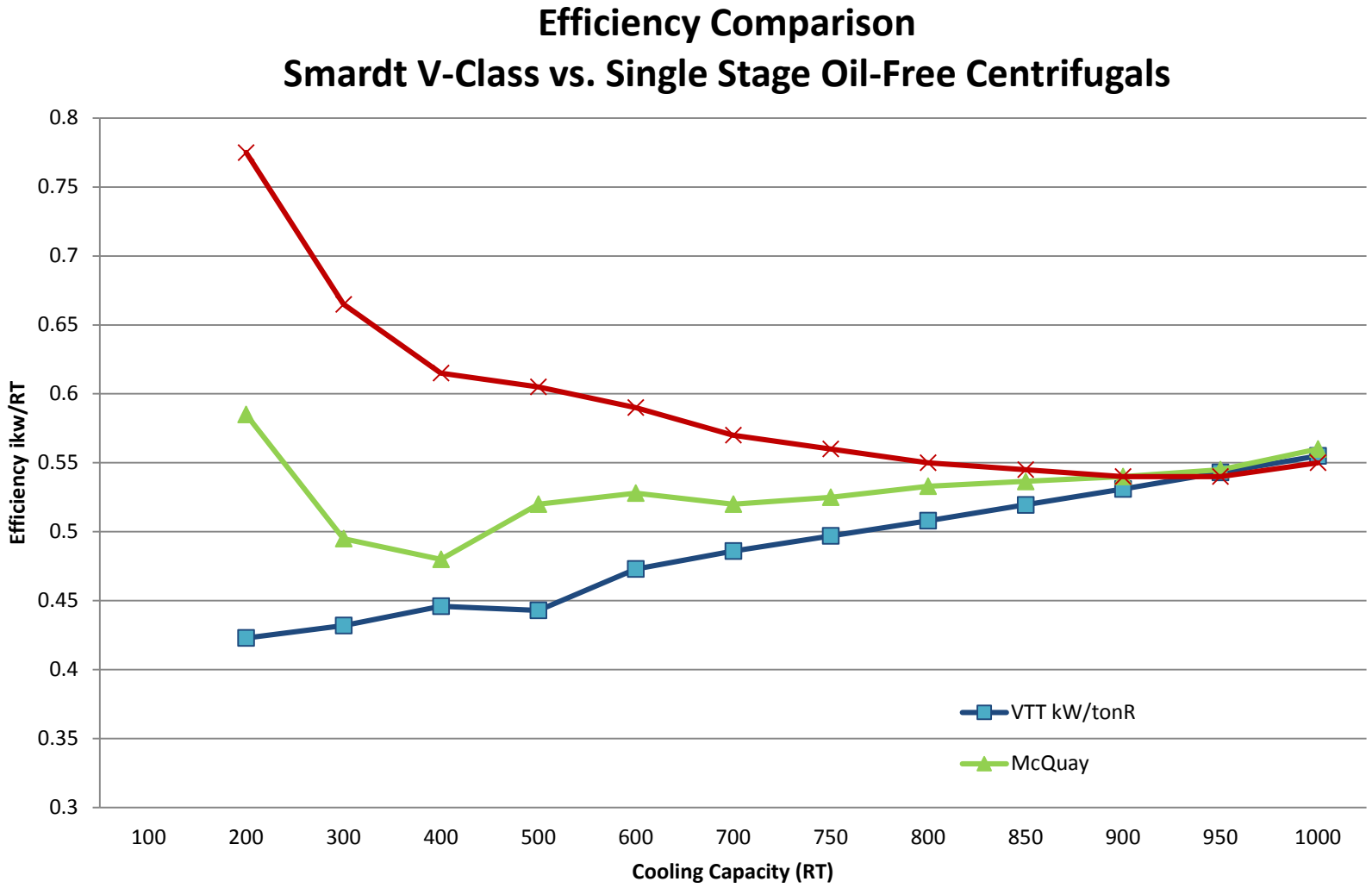
SMARDT

Why choose Smardt over other oil-free chillers?

- Two Stage Oil-Free Centrifugal Compressors used throughout Smardt's Product Range provide the best efficiencies across the entire load profile of the chiller.
  - Single stage compressors used by competitors have limited unloading capabilities, particularly at the higher condensing temperatures found in S.E.Asia
- Unparalleled controls expertise
  - Smardt fully optimises the compressors and chillers
- Smardt designs and manufacturers the HX in house
  - Smardt's pressure vessels are designed and manufactured in house, allowing them to be optimised for the oil-free design



Why choose Smardt over other oil-free chillers?



HIGH COP
ENERGY SAVINGS

INTRAFLOW™
TECHNOLOGY

REFRIGERANT
Environmentally Friendly
R134A

SMARDT

Smardt is the Global Leader in Oil-Free Chillers

Lowest Lifetime Costs drives Smardt to Global Number One

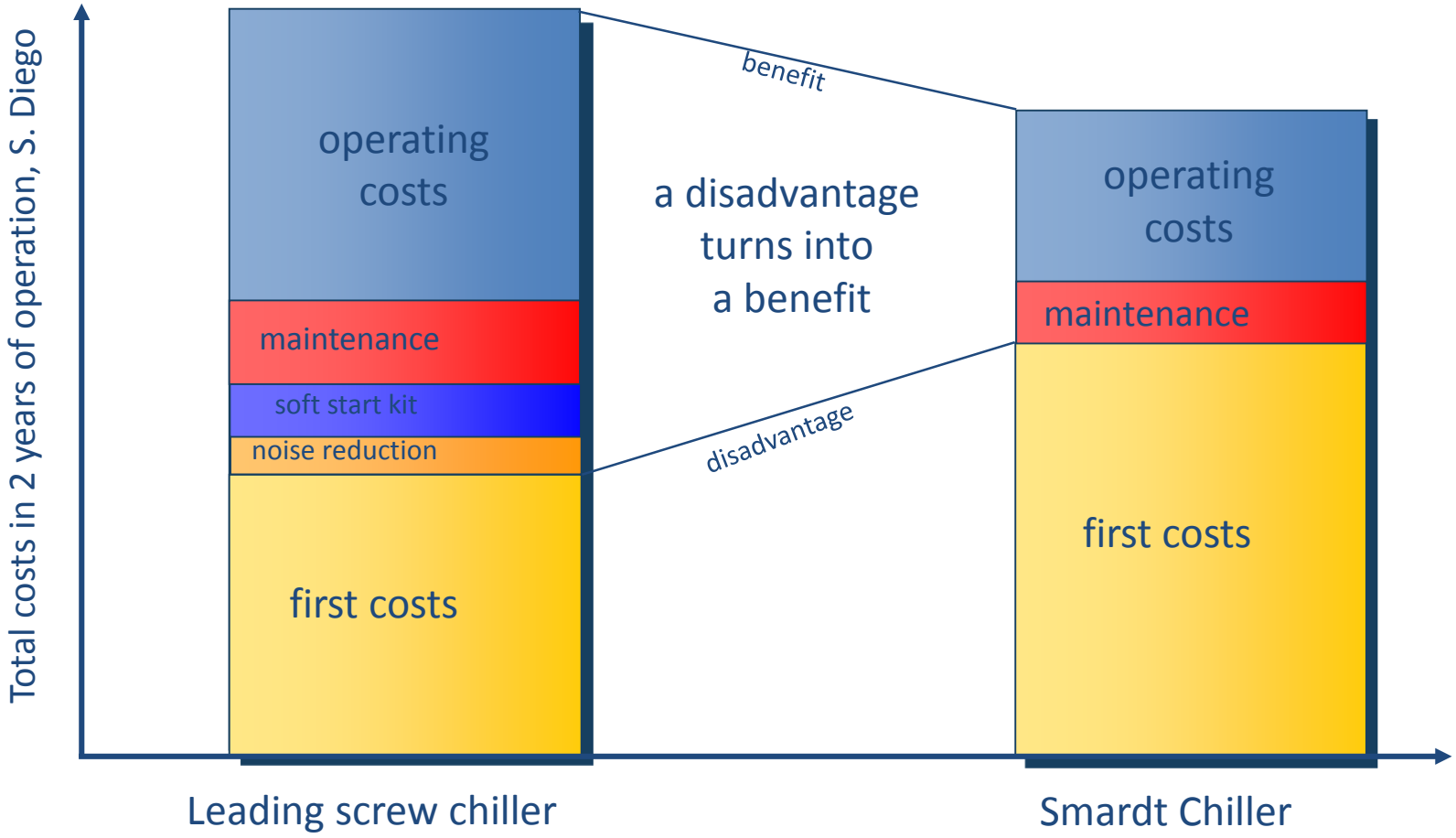
- #1 in Annual Chiller Sales
- #1 in Total Installations
- #1 in Product Range
- #1 in Product Support

Top 10 Oil-Free Chiller OEMs in the world

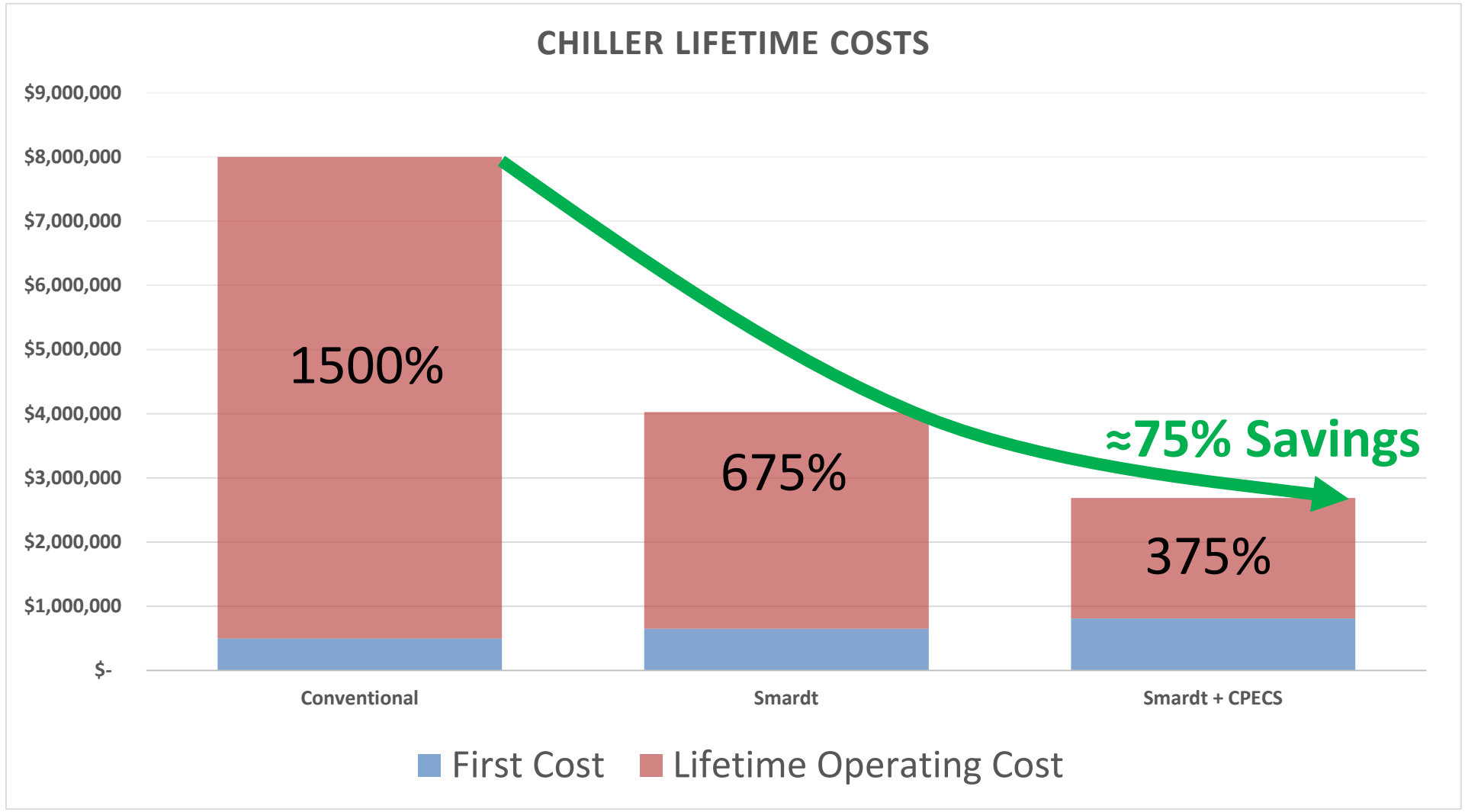
Chiller Lifecycle Costs: The Reality

SMARDT

Lowest Lifecycle Costs



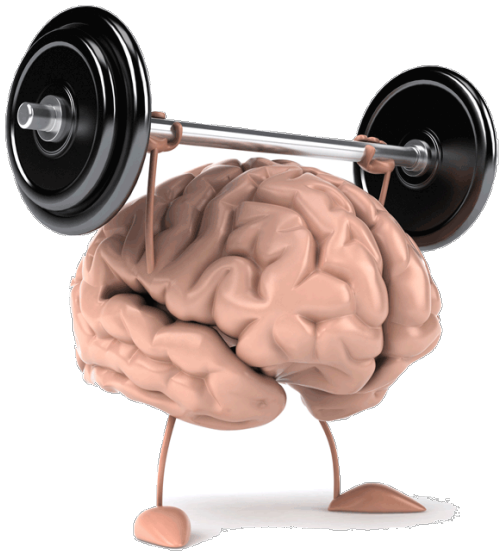
A Lifetime of Savings



SMARDT

Leverage Technology to Reduce Capital Costs

- Smarter designs lead to reduced capex
  - Built in Redundancy with Multiple Compressors
  - No Low Load Chillers Required
  - Eliminate Standby Chillers
  - Reduce Pumps, Pipes & Cooling Towers
  - Reduce plant room sizing
  - Enhanced Flexibility



SMARDT

Alexandra Point Chiller Retrofit

Case Study

SMARDT

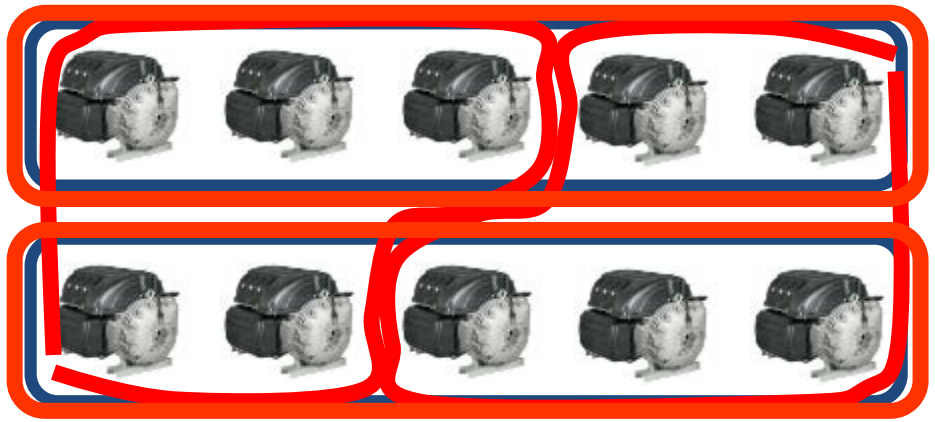
Plant Configuration – Before Retrofit

No	Description	Qty
1	No. Of chillers	4
2	Installed Capacity	1300 RT
3	Operating Tonnage	475 RT
4	Redundancy	825 RT
5	Comprehensive Maintenance Contract Per Annum (Inc. ASD)	$240,000

SMARDT

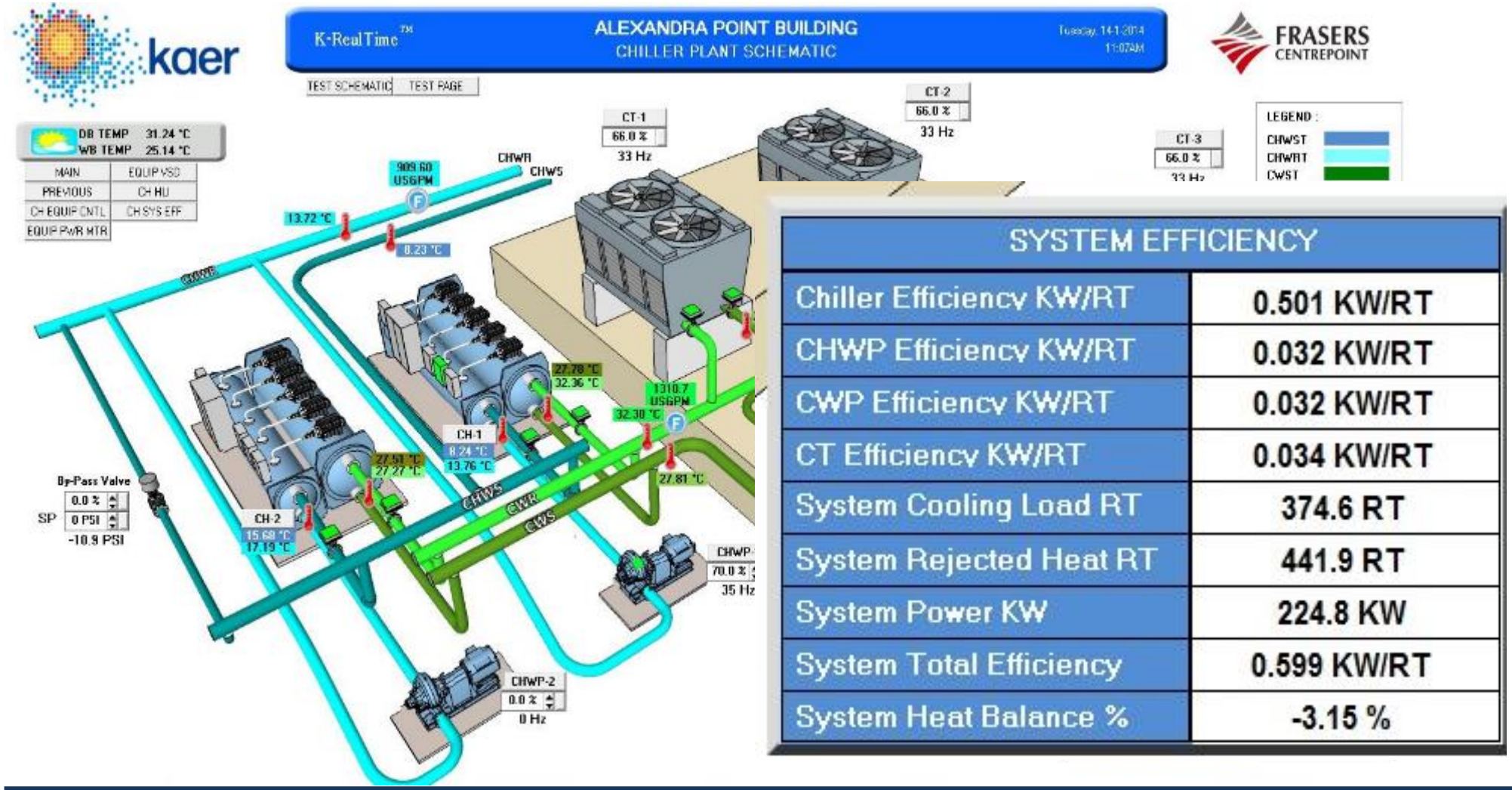
Plant Configuration – After Retrofit

No	Description	Qty
1	No. Of chillers	2
2	Installed Capacity	1100 RT
3	Operating Tonnage	475 RT
4	Redundancy	625 RT
5	Comprehensive Maintenance Contract Per Annum (Inc. ASD)	$60,000



SMARDT

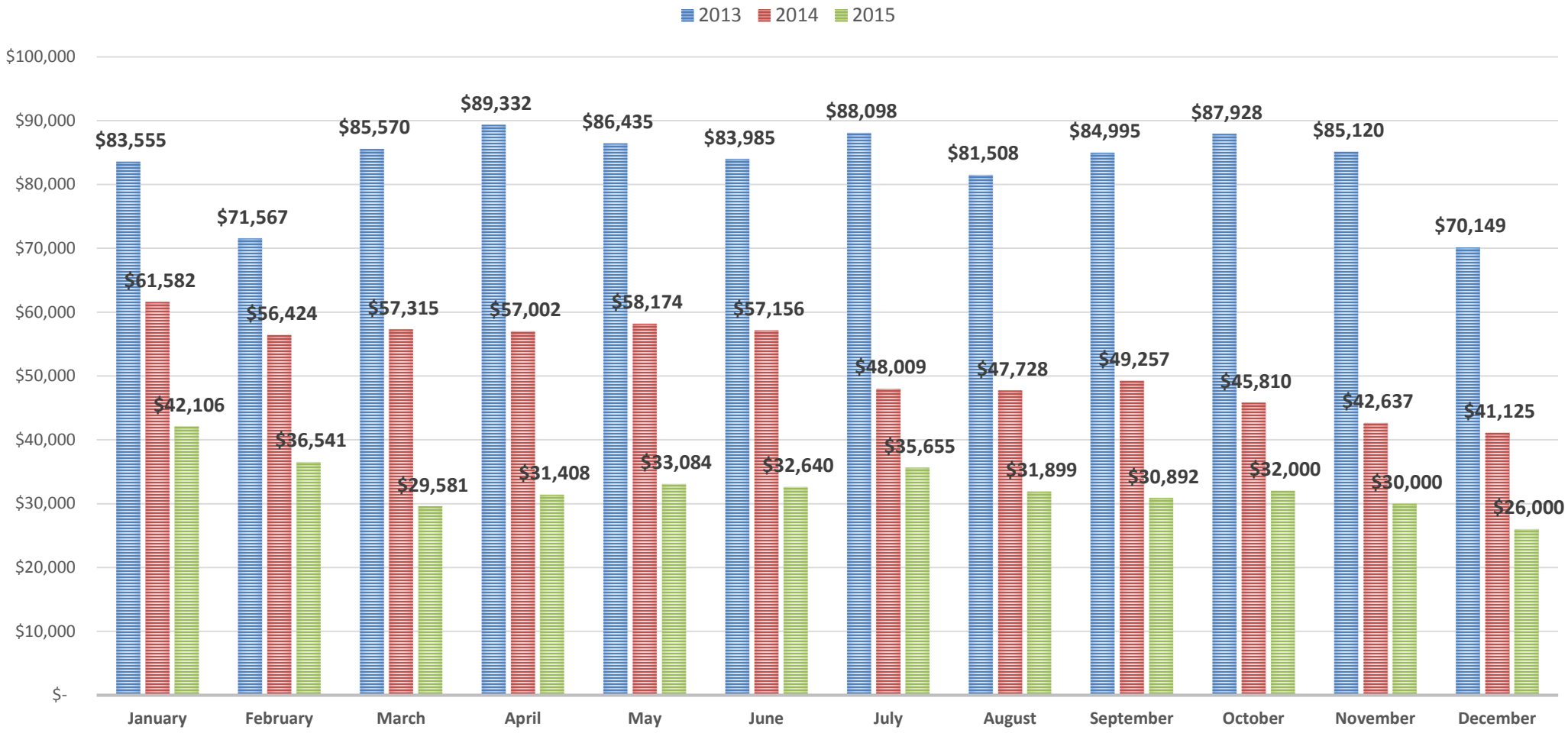
Measurement & Verification



SYSTEM EFFICIENCY	
Chiller Efficiency KW/RT	0.501 KW/RT
CHWP Efficiency KW/RT	0.032 KW/RT
CWP Efficiency KW/RT	0.032 KW/RT
CT Efficiency KW/RT	0.034 KW/RT
System Cooling Load RT	374.6 RT
System Rejected Heat RT	441.9 RT
System Power KW	224.8 KW
System Total Efficiency	0.599 KW/RT
System Heat Balance %	-3.15 %

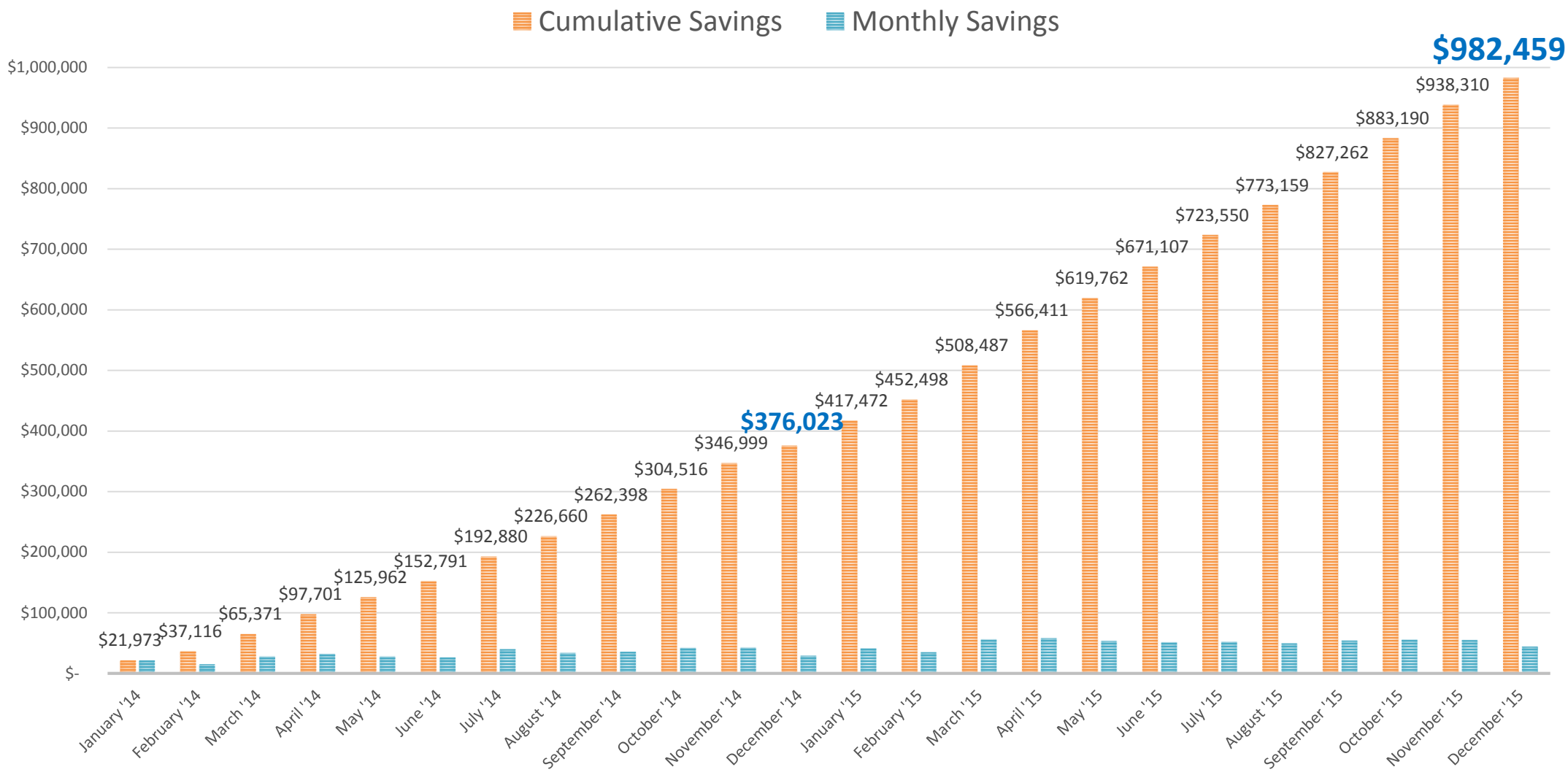
SMARDT

ALEXANDRA POINT LANDLORD ONLY ENERGY COSTS, SGD$



Smardt Chillers Commissioned on the 23rd December 2013.
Additional Plant optimisation carried out March 2015.

ALEXANDRA POINT CUMULATIVE ENERGY SAVINGS, SGD$



SMARDT

Alexandra Point – 2 Year Analysis

Results To Date – Jan '14 – Dec '15 (2 years)

1. Energy Savings To Date	:	2,906,889 kWh
2. Projected Annual Energy Saving	:	1,729,386 kWh
3. Energy Cost Savings To Date	:	$ 982,459 SGD
4. Projected Annual Energy Cost Savings	:	$ 600,000 SGD
5. Simple Payback	:	4.15 Years
6. Incremental Payback Achieved	:	14 Months

Additional Benefits Realised

- 40% Reduction In Investment – 2 less chillers
- 40% Improvement In Plant Effiency
- 45% Reduction In Energy Used
- 17% Reduction In Potable Water Used
- 70% Reduction In Annual Maintenance Costs

Management Objectives

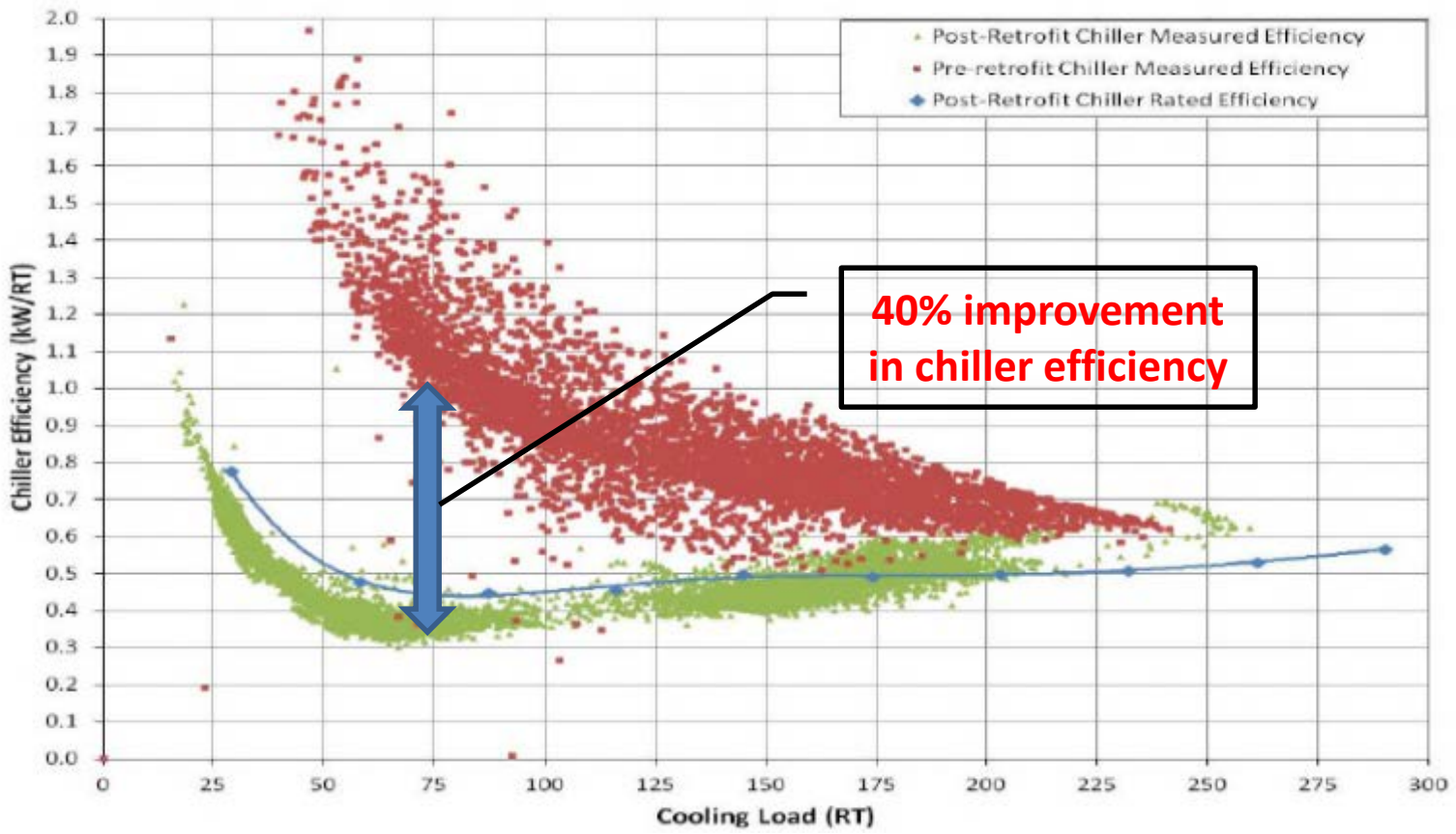
- Green Mark Platinum Achieved
- Exceptional ROI
- Cost Efficient
- Resource Efficient
- Improved Redundancy
- Improved Reliability

SMARDT

Tiger Brewery
Case Study

SMARDT

Singapore, Tiger Breweries (300RT Retrofit)



- Total electricity bill reduced by more than 40%
- Chiller efficiency improved from 0.82 ikw/RT to 0.49 ikw/RT
- Payback in less than 2years

SMARDT

Hong Kong Case Studies

Case Study

Wah Fu Shopping Ctr.

Installed on April 2010

165RT AC

Conventional Chiller: 350 – 420A

Oil Free Chiller: 120 – 220A

Saving Percentage: ~50%

SMARDT

Case Study

TKO Hospital Expansion

Operate Since December 2011

Air Cooled Chiller 1,400 RT

Saving Percentage: ~40%

SMARDT

Case Study

Park Lane Hotel

Operate Since June 2012

Water Cooled Chiller 1,500 RT

Saving Percentage: ~40% (~HK$ 2M)

Carbon Reduction: ~1,800Tons annually

SMARDT

Indonesian Case Studies

SMARDT

Menara Peninsula Hotel – Jakarta, Indonesia

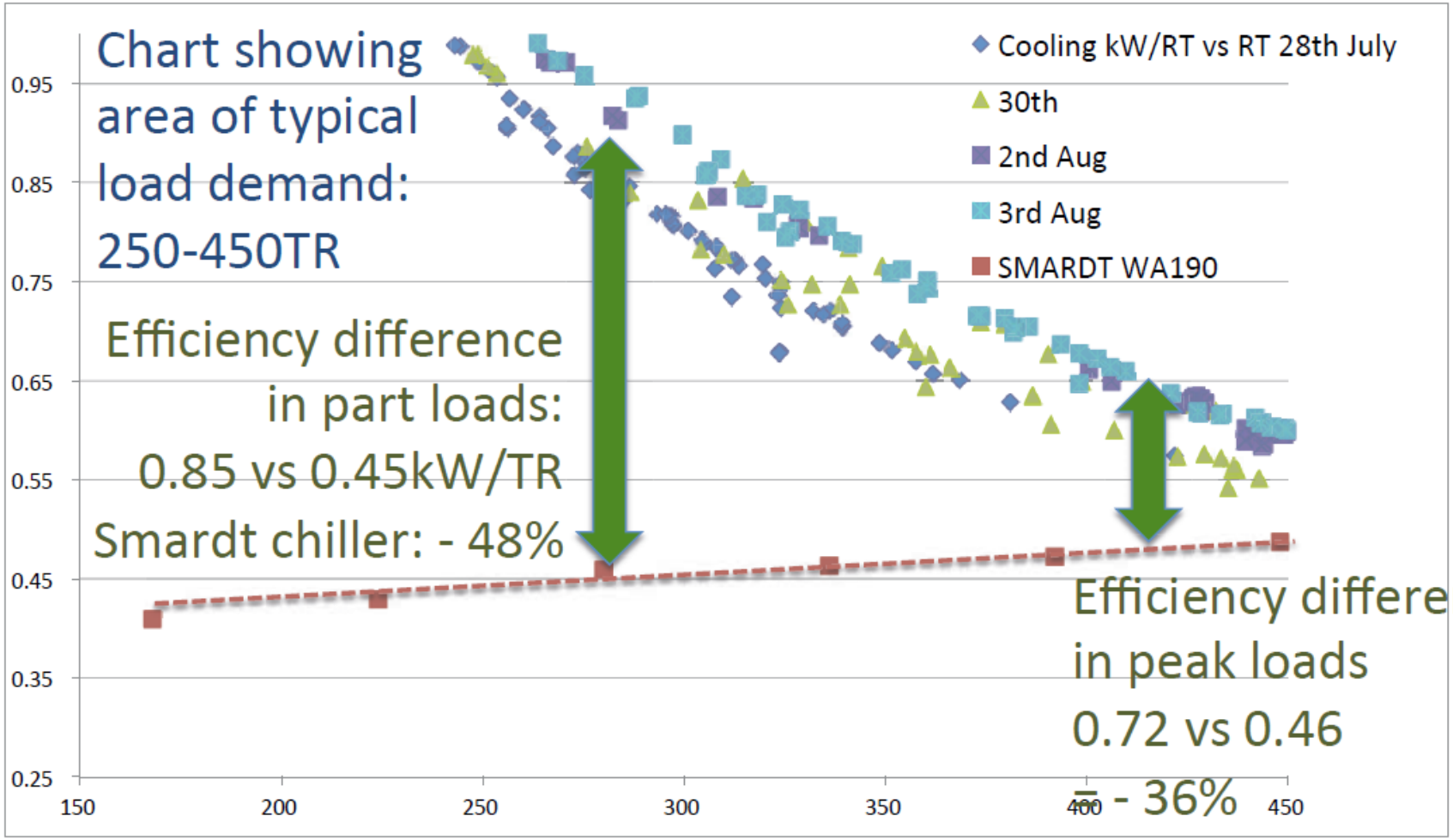
500RT Chiller Retrofit – Old chillers running at 11C

- Reduced Chilled Water temp from 11C to 8C
- Hotel's total electricity bill reduced by 22%
- Electrical savings of 176,000kWh/month or 2,110,000kWh/year
- Payback in less than 1.5years

Hotel Menara Peninsula
A Member of YTC Hotels

SMARDT

Menara Peninsula Hotel -Jakarta, Indonesia



Hotel Menara Peninsula
A Member of YTC Hotels

SMARDT

The Smardt Chiller Choice

- ✓ 100% oil free eliminates oil related maintenance costs
- ✓ Magnetic bearings eliminate frictional losses
- ✓ One moving part assures long service life
- ✓ Highest efficiency for Lowest Operating Costs
- ✓ Very low starting current < 2 amps
- ✓ Lowest noise and vibration as standard
- ✓ The compressors speed adjusts automatically with fully integrated VSD, providing excellent part-load efficiencies
- ✓ Multiple Compressors offers built-in redundancy

AHRI CERTIFIED™ www.ahridirectory.org Air-Cooled Chillers AHRI Standard 550/590 C

AHRI CERTIFIED™ www.ahridirectory.org Water-Cooled Chillers AHRI Standard 550/590 C

→ Smardt understands it better than anyone else

SMARDT

Leading companies trust Smardt

SMARDT

Smardt references worldwide

Carnegie Hall,
New York City

Chicago Mercantile Exchange

MY Oasis

Sydney Opera House

Daimler Benz Germany

→over 5000 more around the world…

SMARDT

Smardt Commercial References

- EMSD Headquarters – Hong Kong
- Bundesagentur Arbeit – EU
- Traffic Kowloon West – Hong Kong
- Urban West Business Park - North America
- Hennessy Center – Hong Kong
- NFL Films Headquarters – North America
- 28 Hennessy Road - China
- Port Moresby's center – Papua New Guinea
- Wah Fu Shopping Center - Hong Kong
- AMP Place – AUS
- PASM Telekom- EU
- Northbank Plaza – AUS
- 73 Northbourne Ave - AUS
- Queen Elizabeth Building, Exhibition – North America
- Postbank – EU
- Deutsche Bank - EU

Smardt Government Building References

- National Congress Building, Beijing - China
- Hong Kong Government House – Hong Kong
- Carseldine Govt Office Precinct – AUS
- Government of Canada Bldg. – North America
- Landeskriminalamt – EU
- Haus des Landtags – EU
- Health Promotion Board - Singapore
- Penrith Government Offices – AUS
- Emcor Government Services– North America
- 48 Owen Street, Barrie – North America
- Württ. Staatstheater Stuttgart – EU
- Maroochydore Government Offices – AUS
- Landeskreditbank Karlsruhe – EU
- Stuttg. Strassenbahnen – EU
- Parliament House, Adelaide - AUS
- Ministry of the Environment – North America
- EMSD Headquarters – Hong Kong

Smardt Industrial / Process References

- Sub-Zero, Arizona – North America
- Riyadh-Cables – Saudi Arabia
- Robert Bosch – AUS, EU, Japan
- Porsche – EU
- GSK – Singapore, AUS, EU
- AB Mauri, Xinjiang - China
- Bayer – North America, EU
- Siemens – EU
- BMW – North America, EU
- Lufthansa- EU
- Volkswagen – EU
- Unilever – EU
- Hershey Chocolate World - North America
- Daimler Benz - EU
- Coca Cola – AUS
- Total – Singapore

SMARDT

Smardt Education References

- University of Canberra - AUS
- Emory University – North America
- Macquarie University – AUS
- Newcastle University – AUS
- University Medical Center – North America
- Sydney Grammer School – AUS
- Universität Freiburg – EU
- Universität Konstanz – EU
- Parap Primary School – AUS
- Royal Melbourne Institute of Technology RMIT – AUS
- University of Queensland - AUS
- Australian Institute of Management -AUS
- University of La Verne – CAN
- 'Martin Community College – North America
- Universität Würzburg – EU
- Polytechnic University G-H Core – Hong Kong

Smardt Hotel References

- Four Points Sheraton -AUS
- Observatory Hotel Sydney – AUS
- Novotel Homebush, Darling Harbour - AUS
- Ivy Hotel – AUS
- Hotel Santa Clara - North America
- Four Seasons Hotel Sydney
- Nelson Bay – AUS
- Hilton Hotels
- Hyatt Hotel -AUS
- Park Regis - AUS
- Sofitel Hotel Brisbane – AUS
- Mercure Harbourside Cairns, Melbourne
- Dorint-Hotel – EU
- Hotel Residenz Bülow – EU
- Pacific Beach Hotel – North America
- Harvey's Hotel Casino – North America
- Holiday Inn - Darling Harbour, Potts Point, Townsville, Perth

Smardt Hospital references

- Royal Perth Hospital – AUS
- Cardinal Health- AUS
- TOOWOOMBA HOSPITAL – AUS
- Washington Hospital – North America
- Diakoniekrankenhaus Rotenburg – EU
- Harrison Medical Center – North America
- Christchurch Hospital - NZ
- Lower Hutt Hospital – NZ
- Krankenhaus Schwetzingen – EU
- Tai Po Wong Siu Ching Clinic - China
- Sutter Health – North America
- Canberra Hospital - AUS
- Tuen Mun WH Clinic – China
- Bathurst Hospital – AUS
- UHS Wilson Medical Center – North America
- Flinders Medical Centre – AUS
- Queen Elizabeth Hospital – Hong Kong
- Tin Shi Wai Health Centre – Hong Kong

SMARDT

Smardt Data Center references

- Orlando Data Center - USA
- Global Switch -2 TAI Seng Ave - SING
- IBM - EU
- FUJITSU - AUS
- WCCC Data Center Phase - USA
- AT&T - USA
- Optimus -AUS
- Infraserv Höchst - EU
- WAYMOUTH TELEPHONE EXCHANGE – AUS
- COTTESLOE TELEPHONE EXCHANGE - AUS
- WETA DIGITAL - NZ
- DATEV Rechenzentren - EU
- TELSTRA - CENTRE - AUS
- TELECOM - NZ
- WELLINGTON EXCHANGE - AUS
- VODAFONE – NZ
- Infraserv – EU
- SAP - EU

SIEMENS DATEV IBM vodafone

GLOBAL SWITCH at&t telecom

SAP FUJITSU EUMETSAT nts.workspace

SMARDT

Smardt Airport References

- Gold Coast Airport - AUS
- Brisbane Airport – AUS
- Westralia Airport Corp T3 – AUS
- Perth Domestic Airport – AUS
- Gander International Airport – North America
- Airport Stuttgart - EU

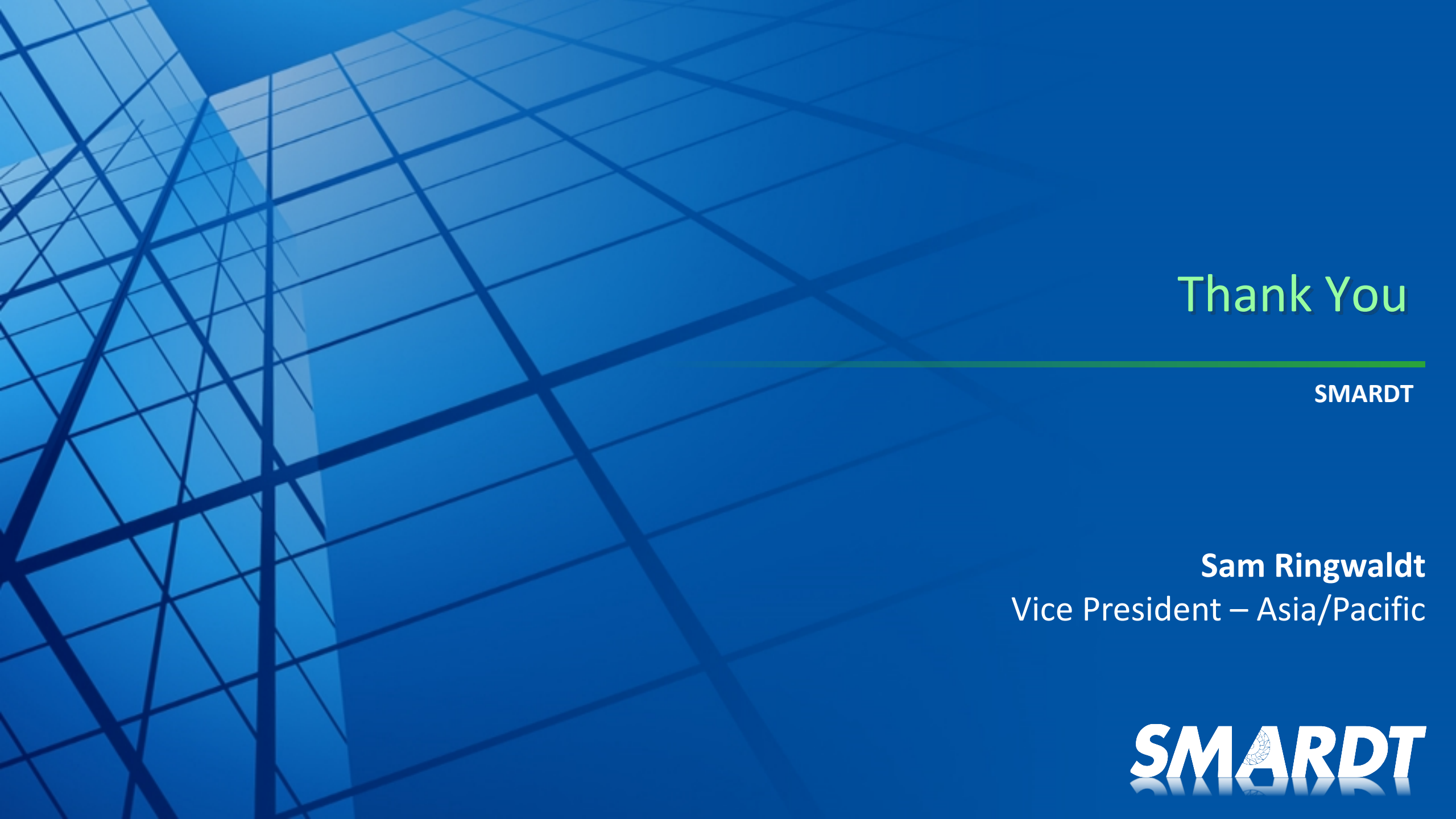
Brisbane Airport
Queensland Australia

Gold Coast Airport

GANDER INTERNATIONAL AIRPORT
GANDER IS TOPS

Flughafen Stuttgart

SMARDT



Thank You

SMARDT

Sam Ringwaldt
Vice President – Asia/Pacific

SMARDT