
SMARDT
The Most Trusted Oil Free Chiller Manufacturer in the World
SMARDT

SMARDT

ABOUT US

Pioneer & world leader in high efficiency oil-free chillers

KEY FACTS

Pioneer

Founded 1995 by Turbocor founder Roger Richmond-Smith

Technology

Development centers in Stuttgart, Montreal, Melbourne

Global

Manufacturing in Germany, Australia, Canada, USA, China, Brazil

History

Largest oil-free chiller installation base with some 8000 installed

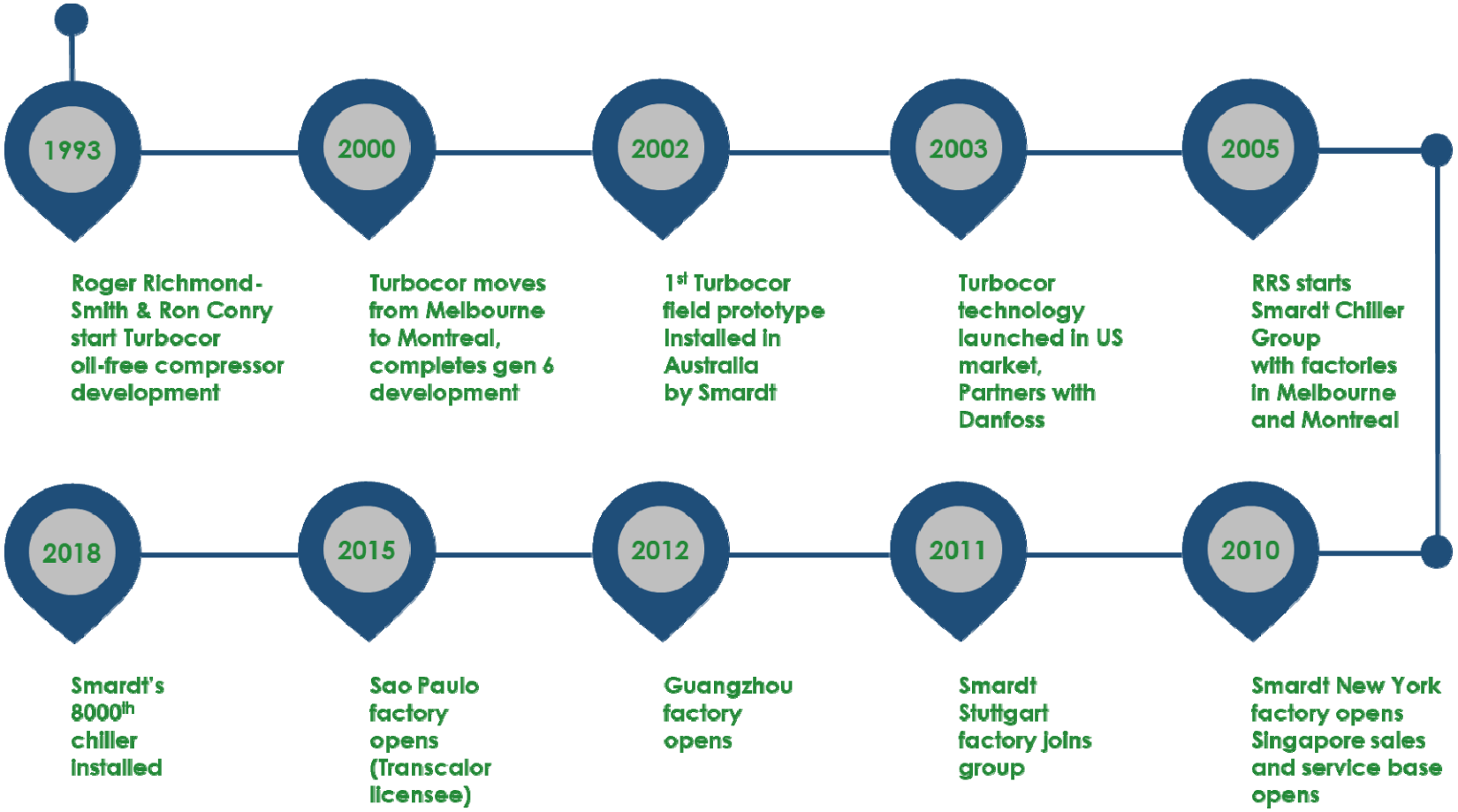
Expertise

Largest user of Turbocor compressors in the world

Know-how

Unparalleled experience across a diverse range of applications, climates and industries

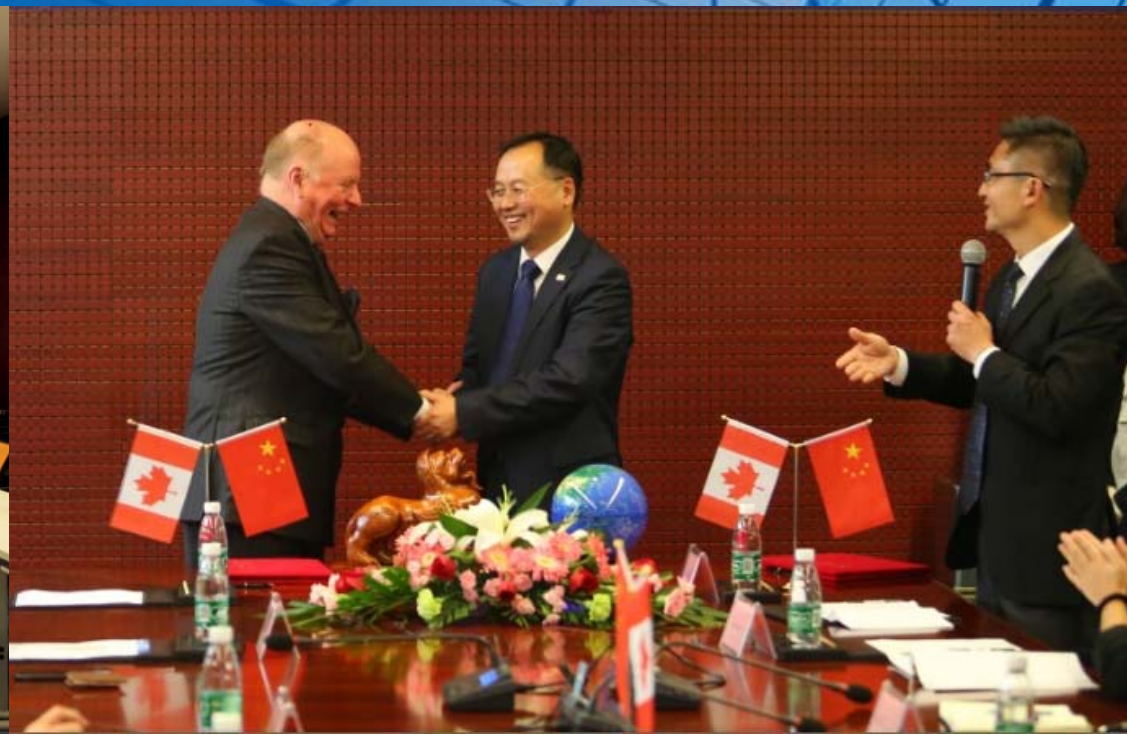
Smardt magnetic bearing oil-free chillers: a 25 year timeline



Some 3,000 oil-free chillers installed in North America

Some 8,000 oil-free chillers installed worldwide

Some 19,000 oil-free compressors installed globally



TICA-Smardt Global JV in 2018
天加-Smardt 全球JV合作

加拿大蒙特利尔 集团运营和研发中心
120,000 sf

新加坡
东南亚销售、服务和培训中心

ONE DESIGN,GLOBAL MANUFACTURER
统一的设计，全球的制造商

美国普拉茨堡生产
销售中心

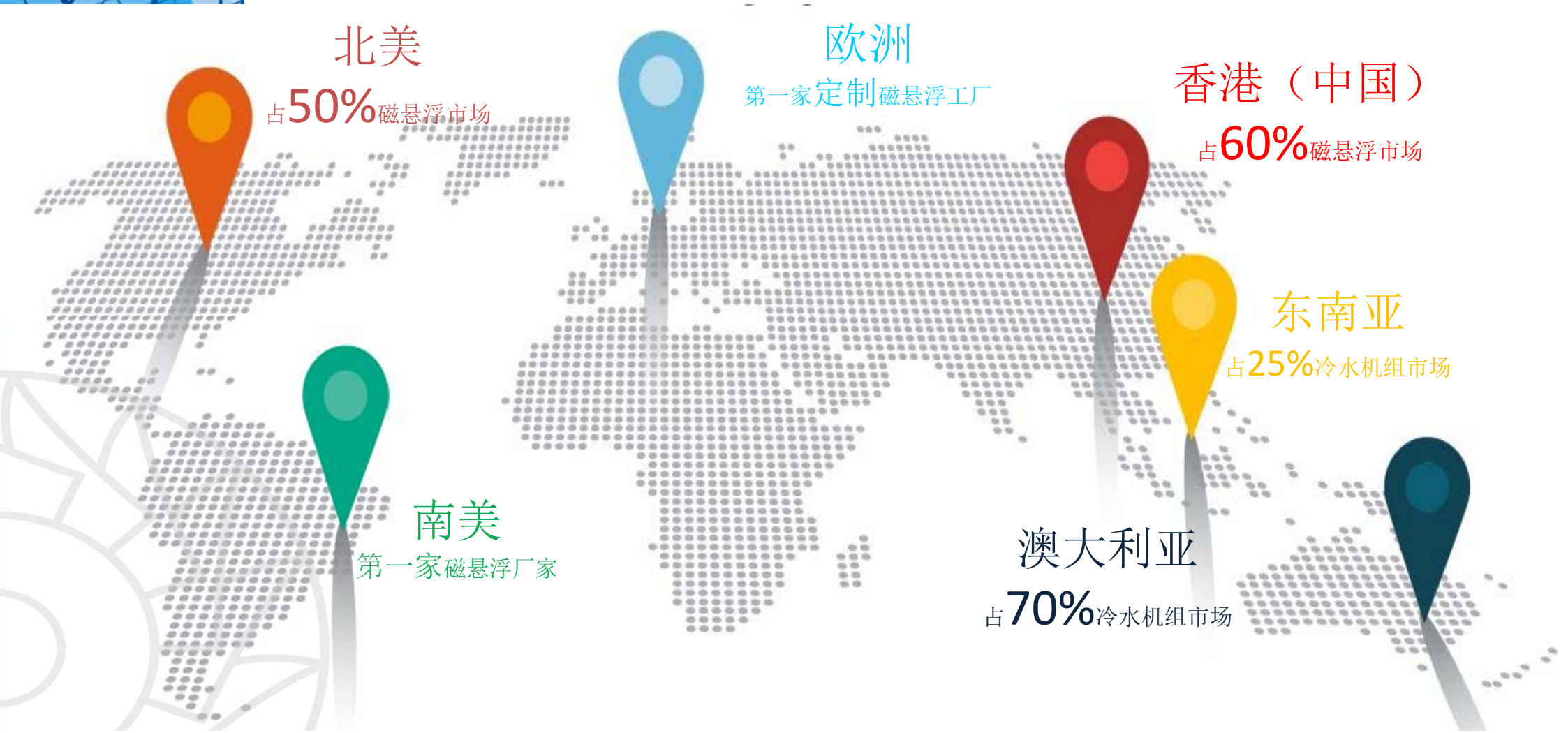
墨尔本
49,000 sf

中国广州
49,000 sf

斯图加特
39,000 sf

圣保罗
生产和销售中心

全球占有率概述


北美
占50%磁悬浮市场
欧洲
第一家定制磁悬浮工厂
香港（中国）
占60%磁悬浮市场
东南亚
占25%冷水机组市场
南美
第一家磁悬浮厂家
澳大利亚
占70%冷水机组市场

Smardt is the Global Leader in Oil-Free Chillers

Lowest Lifetime Costs drives Smardt to Global Number One

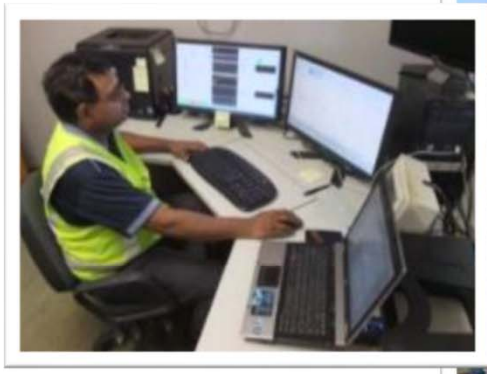
- #1 in Annual Chiller Sales
- #1 in Total Installations
- #1 in Product Range
- #1 in Product Support

Top 10 Oil-Free Chiller OEMs in the world

State of the Art Test Facilities

AHRI Approved Chiller Test Facilities

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



AHRI CERTIFIED™
www.ahridirectory.org

Service Capability

- Experience product support team in every country
- In-house service and maintenance team
- Authorised Danfoss Turbocor Service Partner
- More than 5 million USD of spare parts in stock

Product Range

TICA®

Smardt Product Range Summary

AHRI CERTIFIED™ www.ahridirectory.org

T^W-Class 水冷冷水机组
60-1200RT

V-Class 水冷冷水机组
700-3200RT

T^A-Class
风冷冷水机组
60-450RT

E-Class
蒸发冷机组
60-300RT

G-Class
低GWP新冷媒机组
80-530RT

CPECS
中央冷站智能控制系统

Widest range, Largest capacity in the Industry
60-3200TonR (210-11000kWR)

T^W-Class Water Cooled Chillers

60-1200 TonR – 210 - 4200 KwR

- Integrated Redundancy with Multiple Compressors
- Optional Configurations, Stacked or Side by Side to meet space requirements.
- Economiser Options Available
- 1 to 8 Compressors
- Mechanically Cleanable HX
- Unimpeded Service & Maintenance Access

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

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

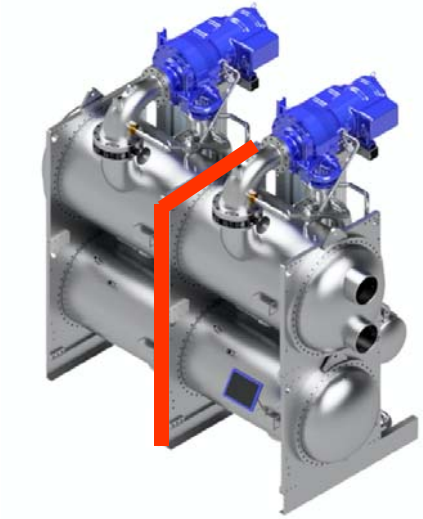
AHRI CERTIFIED™
www.ahridirectory.org
Water-Cooled Chillers
AHRI Standard 550/590

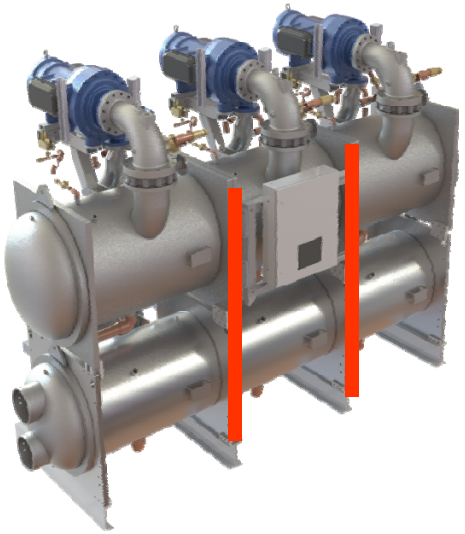
V-Class Water Cooled Chillers

600-3200 TonR – 2100- 12000 KwR

- Highest IPLV rating in centrifugal chillers - >10.8 COP
- Compact Design Footprint
- 1 to 8 Large VTT Compressors

V-Class Modular series



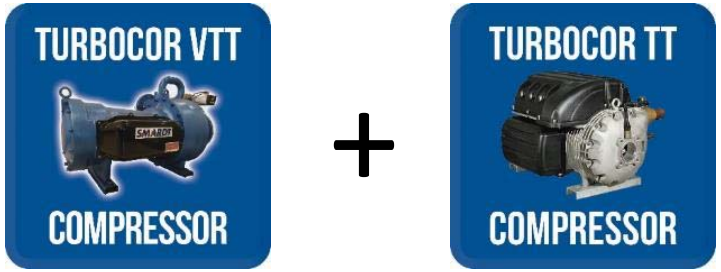


Water Cooled V-Class “Pony Express”

500-3600tonR(1230-12600kWr)

Multiple Large compressors running in parallel with a single small compressor extends the chillers capabilities at full and part load (2%)

Very suitable for Mixed Development projects




Data Centres - Singapore


SMARDT
Industrial - USA


Coal Mine - Australia


Automotive - Germany


Hotels – Sri Lanka


Mixed Development –
Indonesia

T^A-Class Air Cooled Chillers

60-450 TonR – 210 - 1600 KwR

- Compact Design Footprint
- “V” Coil Configuration for Added protection and ease of installation.
- 1 to 4 Compressors
- Unimpeded Service & Maintenance Access
- Highly protected against corrosion.
- EC Fans Standard

E-Class Evaporatively Cooled Chillers

60-300 TonR – 210 - 1055 KwR

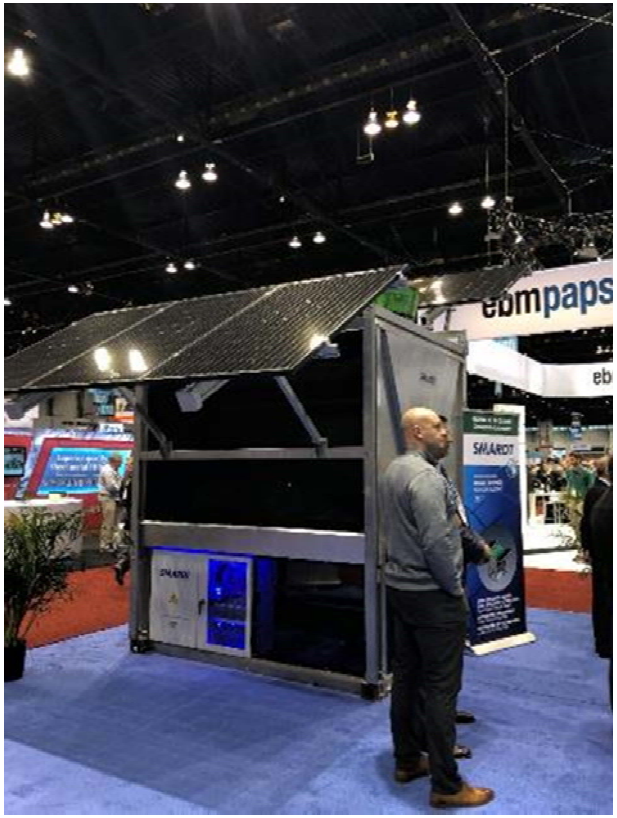
- High Efficiency, Adiabatically Assisted Cooling.
- Highly protected against corrosion.
- 1 to 3 Compressors
- Indirect Direct Evaporative Cooling (IDE) Modules Available
- Efficiency close to Water Cooled with Less Maintenance
- Solar Assisted Fans

G-Class Low GWP Chillers – Air and Water Cooled

80-530 TonR - 210 - 1600 KwR

- Low GWP – HFO Refrigerants Available
  - HFO R1234ze
  - HFO Blend 513a

Renewable Energy Chillers



Integrated pump skids

H-Class Heat Pump Series *100-400 RT*
(Coming soon)

Modular Package Units

Why SMARDT?

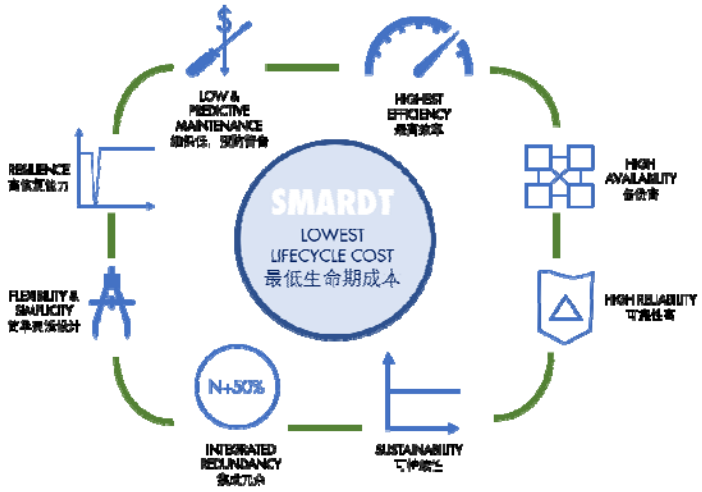
TICA®

Question:

Why should you choose a Smardt oil-free chiller?

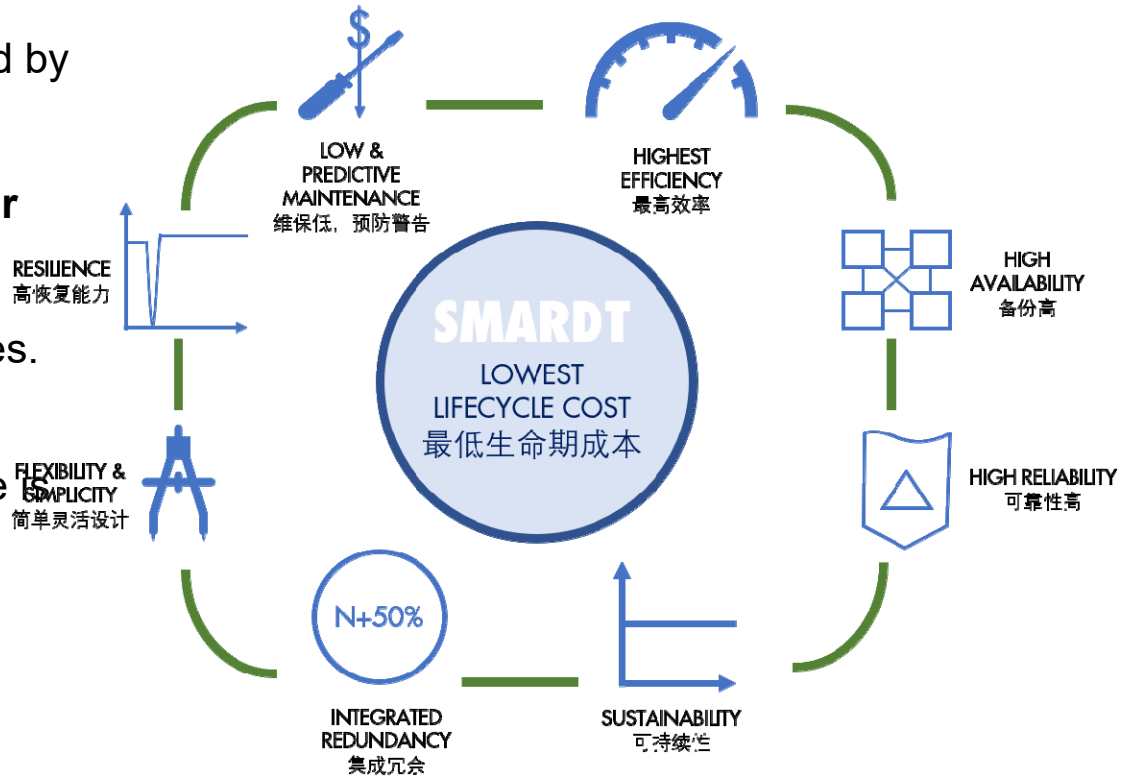
Answer:

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



Lowest Cost of Ownership
Increased Reliability = Decrease Maintenance & Service Costs

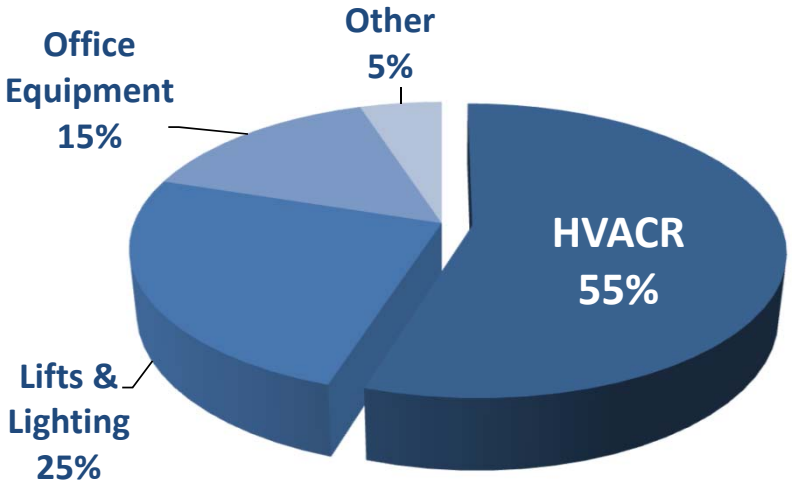
- Over **70% of chiller field/service costs** are caused by oil-return issues.
  (Sources: Emerson Electric, AHRI)
- Conventional chillers degrade by more than **20% for every 10 years of operation**
  (Source: Tsinghua Research Project 2015)
- Smardt Chillers have no oil, and no wearing surfaces.
- Oil-Related Maintenance is Eliminated
- Magnetic Bearings ensure Mechanical Maintenance is reduced
- Smardt's customers have reported reductions in Maintenance costs of around 50%.



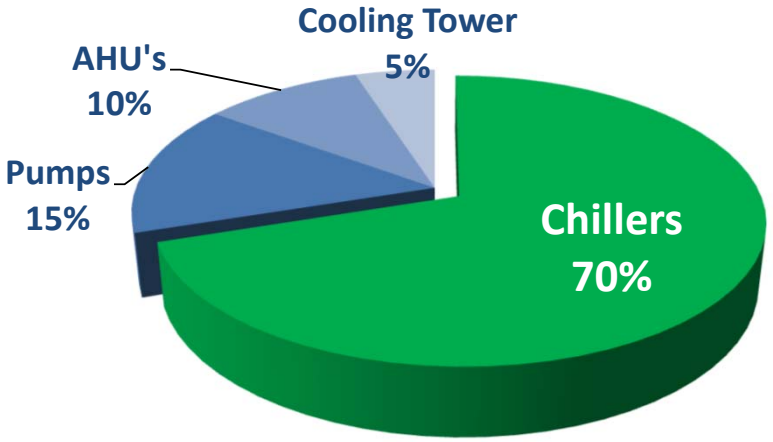
Providing the Highest Efficiencies

- 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



Boost Annual Profits

- Air-Conditioning has an extremely significant operating cost which directly affects profitability.
- Re-Engineering and retrofitting to high efficiency systems will have a visible impact on the bottom line.

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

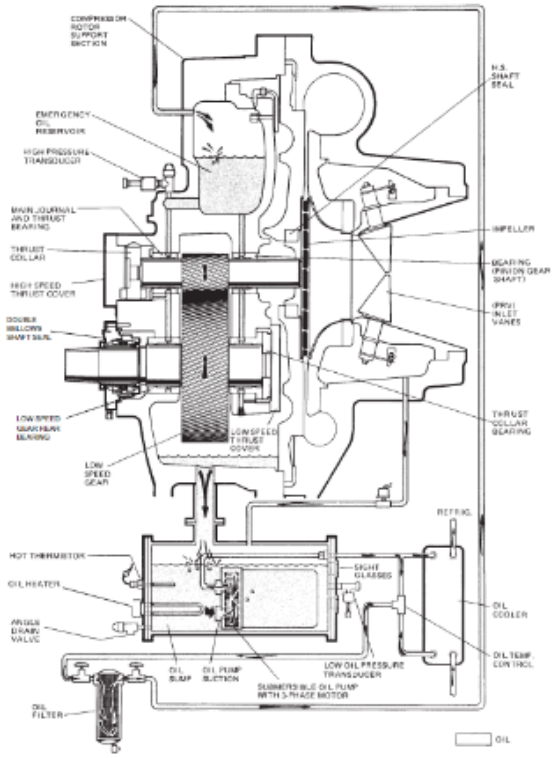
Conventional Chiller Issues – Outdated Compressor Technology

- 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.

Complex Oil Management = Chiller Issues

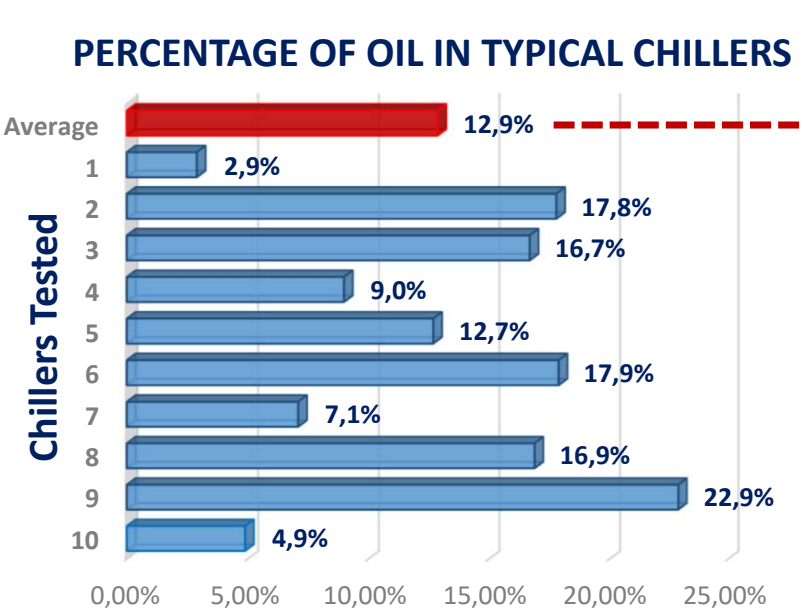


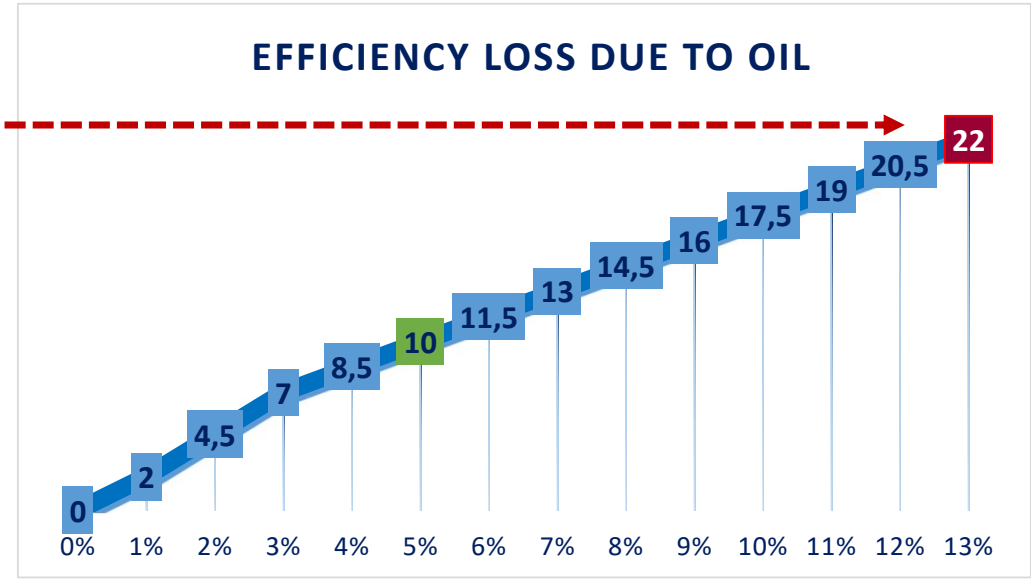
Oil Management of a Conventional Centrifugal Compressor

- 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

ASHRAE RESEARCH ON OIL'S IMPACT ON EFFICIENCY



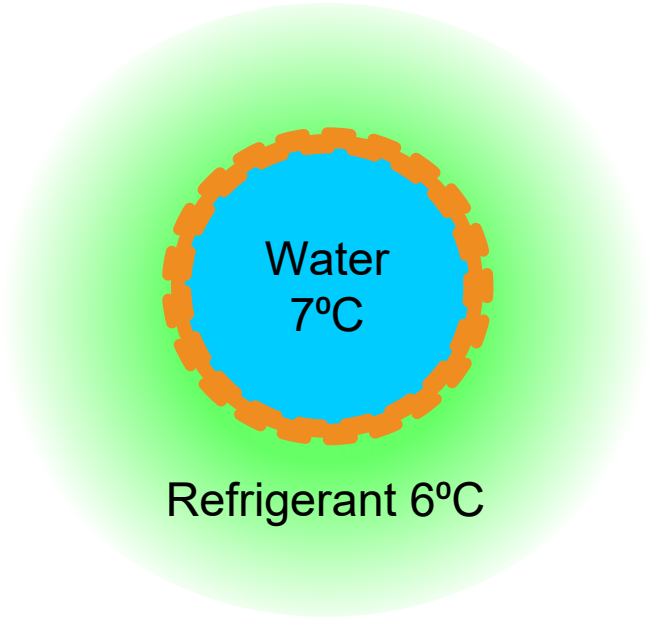


"An ASHRAE study determined that the vast majority of installed chillers have an excess amount of oil in the cooling system."
ASHRAE Research Study 601

The above study depicts the loss of efficiency based upon the percentage of oil found in the chiller. Even just 5% of oil is a 10% Efficiency Loss

How does oil impact performance?

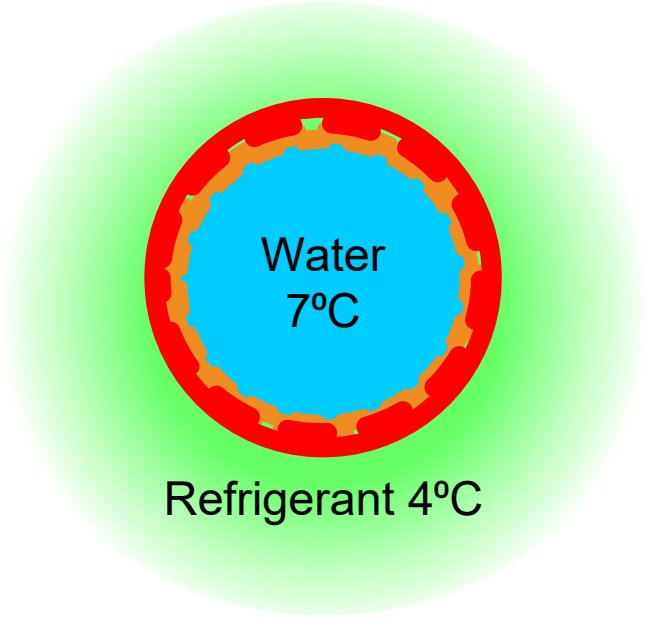
- Heat exchanger with no oil
  (Brand new chiller or a Smardt oil-free chiller)



Healthy 1ºC approach temperature
(Difference between water temperature and refrigerant temperature)

Oil accumulates and increases the approach to 3ºC

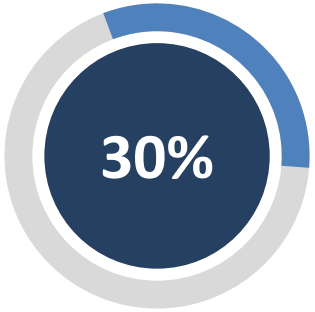
- Heat exchanger with oil
  (Oil-based conventional chiller)



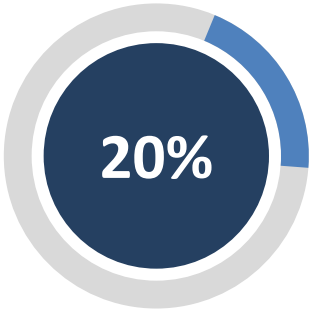
Unhealthy 3ºC approach temperature
(Oil slick/coating on the heat exchange surface)

SMARDT

How does oil impact performance?



Capacity decreases up to 30%



Efficiency decreases up to 20%

The In-Direct Cost of Oil

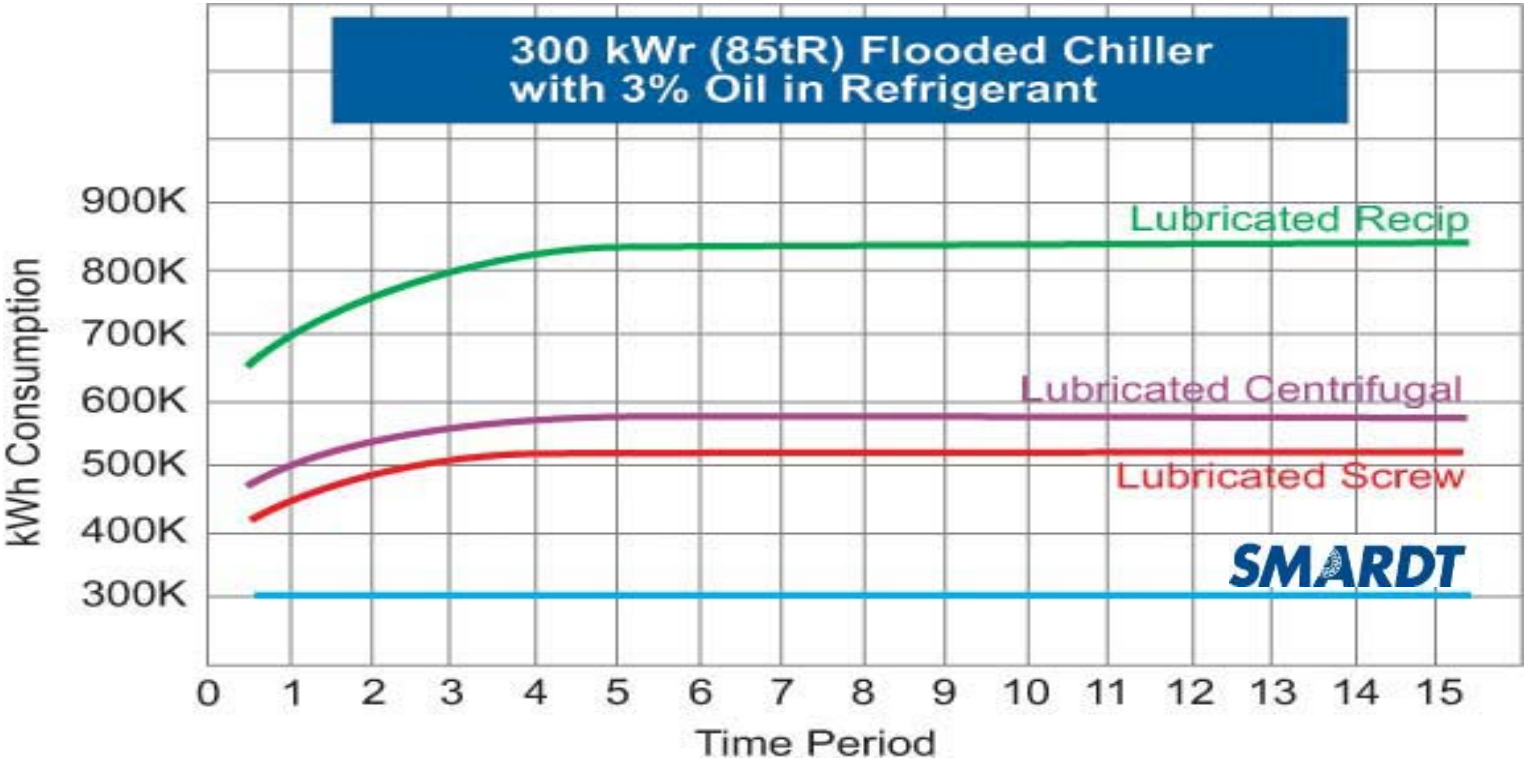


Diagram: as this comparative study showed, over 20% of lubricated chiller's operating efficiency is routinely lost in the early years as a result of oil clogging of heat transfer surfaces.

EFFECTS OF OIL ON THE CHILLER SYSTEM

1000TR Chiller, 4000 Hrs/Yr at IPLV

Annual Energy & Maintenance Cost

1.- Oil contamination causes loss in Efficiency
- 8%-10% Loss

124,900 kWh

2.- Oil Heater runs when Chiller doesn't run
- 5 Heater motors run at 0.75kW
- 4760 hrs per year

17,850 kWh

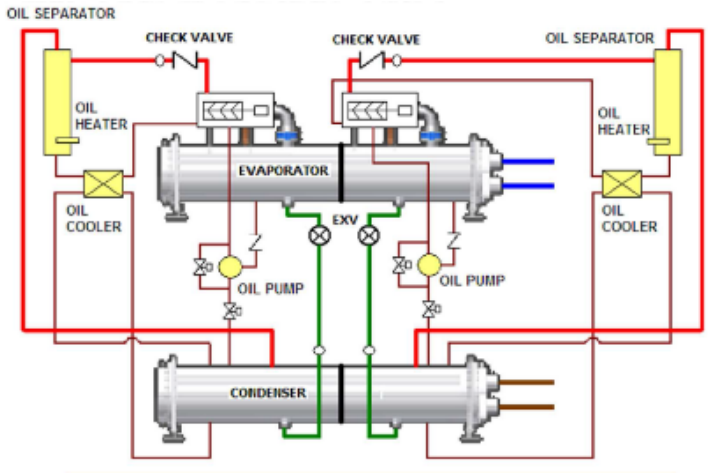
3.- Oil Pump runs when Chiller runs
- 1.5 HP (1.125 kW)
- 4000 hrs per year

4,500 kWh

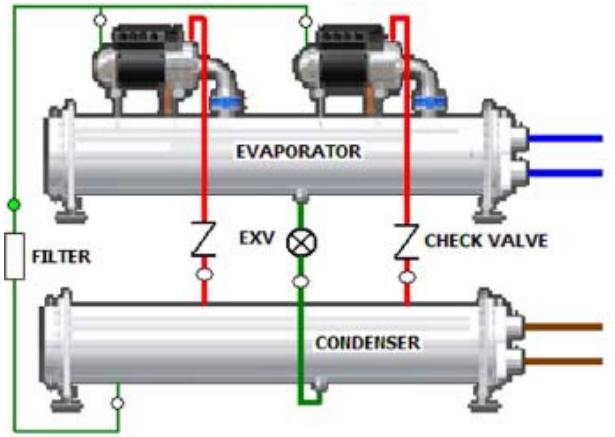
Total = 147,250 kWh / Year

For the purpose of the Life Cycle Cost, it is assumed that 3 - 5% of oil concentration is a typical scenario and occurs within 2 years of operation for flooded evaporator systems.

Reduction in Failures through Simplified Piping



Oil Reliant Chiller



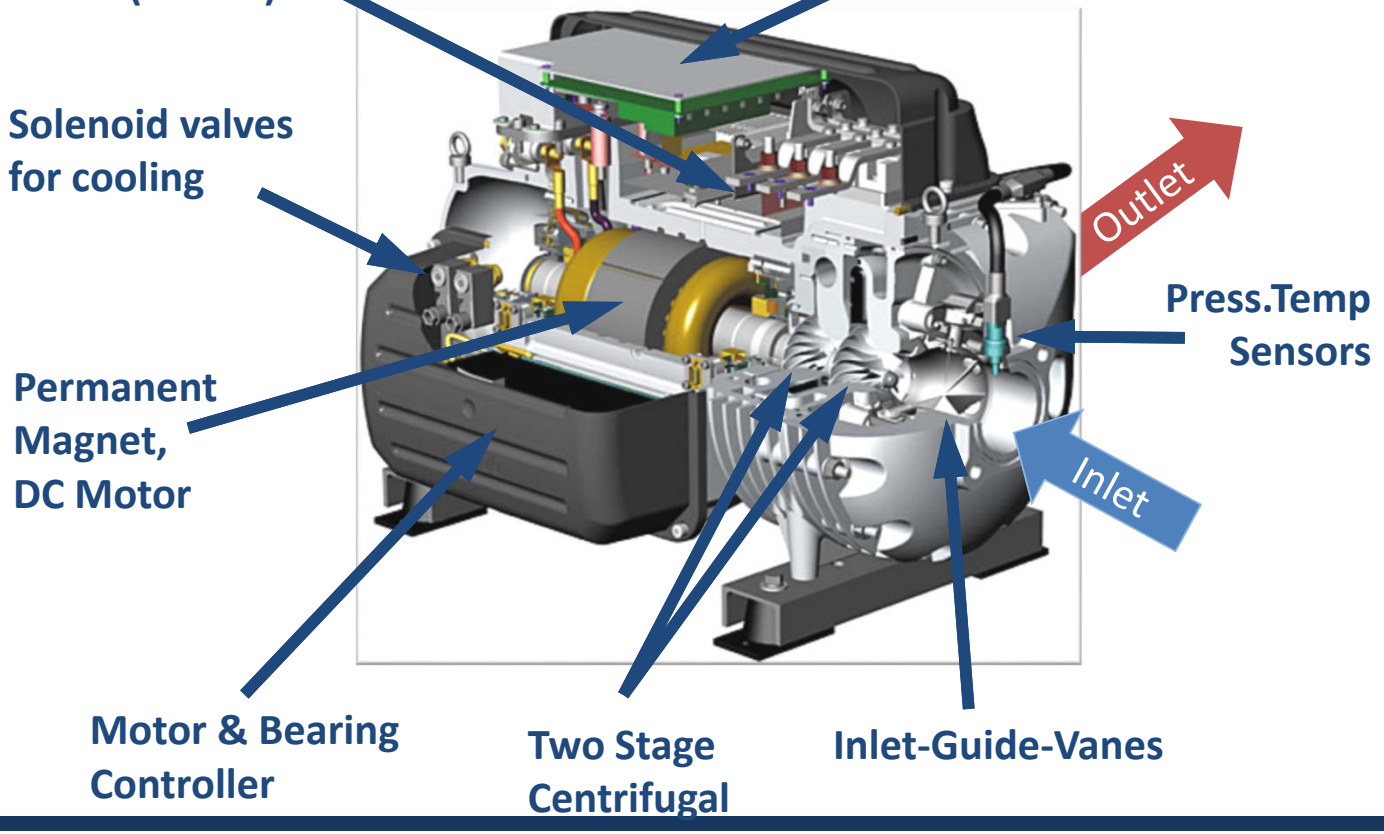
Oil-Free Chiller

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

The Smardt-er Alternative - One Solution

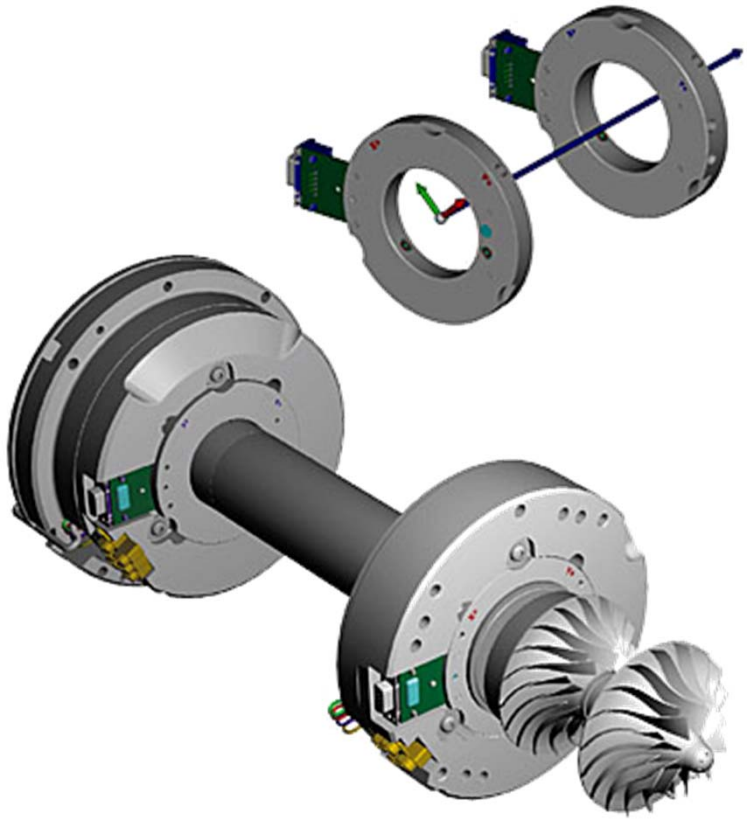
- A Magnetic Bearing, Oil-Free, Centrifugal Compressor.
- Designed from the “ground up” to address the issues and the need for environmental responsibility.
- This revolutionary compressor provides:
  - Increased Energy Efficiency
  - Elimination of Oil Related Issues
  - Noise Reductions
  - Reduced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

Revolutionary compressor technology



Key Technologies - Magnetic Bearings

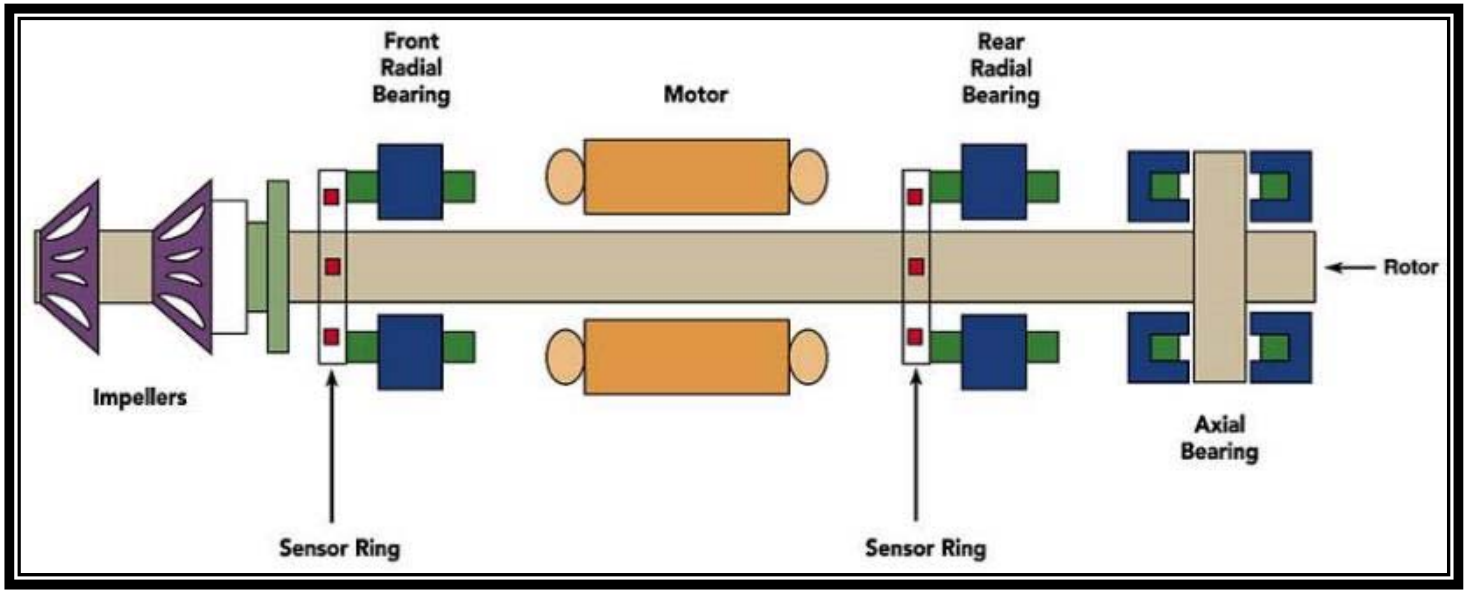
- Magnetic Bearings
  - Eliminate high mechanical friction losses
  - Increase equipment life through elimination of wear surfaces
  - Eliminate oil-related heat transfer losses
  - Eliminate complex oil management systems (controls and hardware)



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

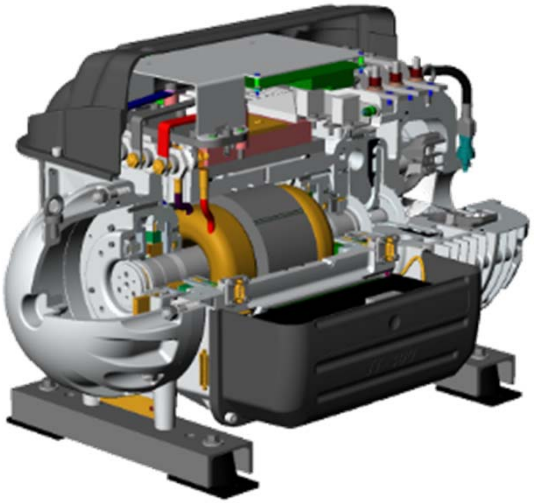
Magnetic Bearing System



- 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.

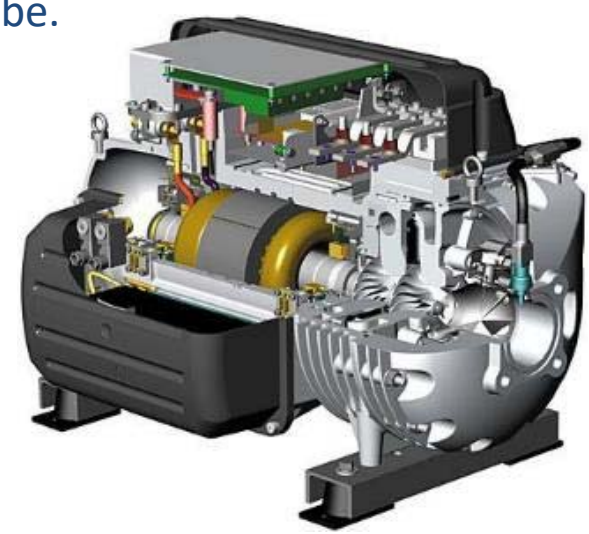
Power Outage?

- 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.



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.



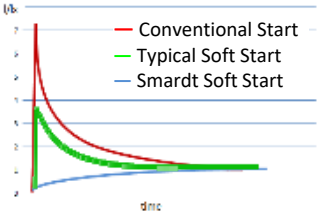
Smallest Centrifugal Compressor

- 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

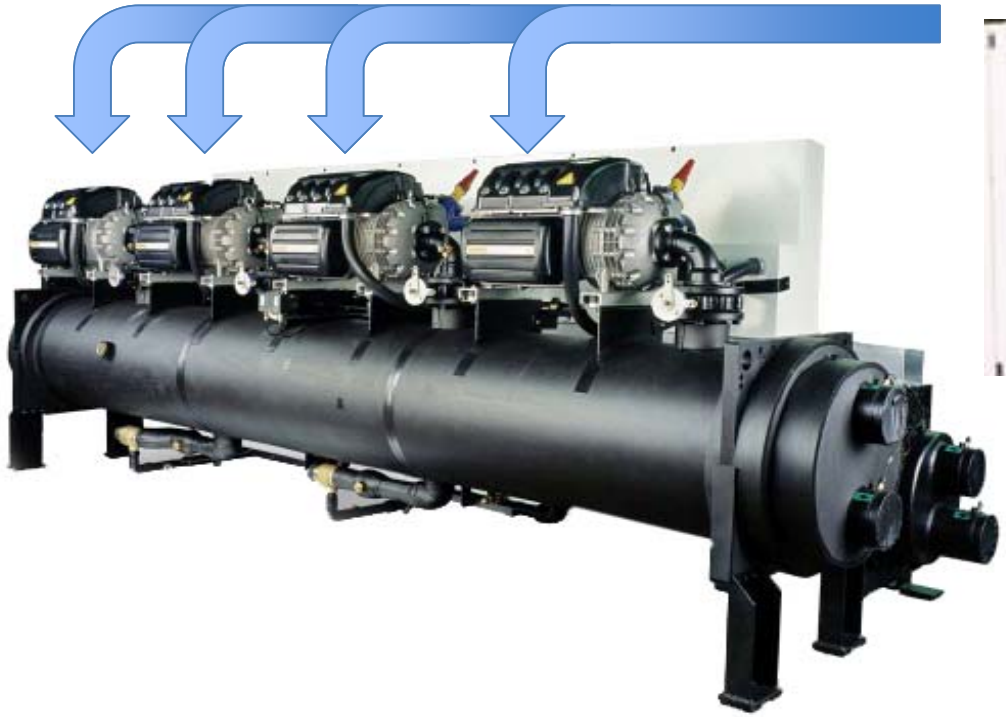
- An innovative, permanent magnet, brushless DC motor which helps to reduce the size of the compressor:
- The motor is 160hp but is the size of a conventional 1hp induction motor.
- Compare the motors in the picture:
  - Rear = Turbocor 160HP motor
  - Front = conventional 120HP motor

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.



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

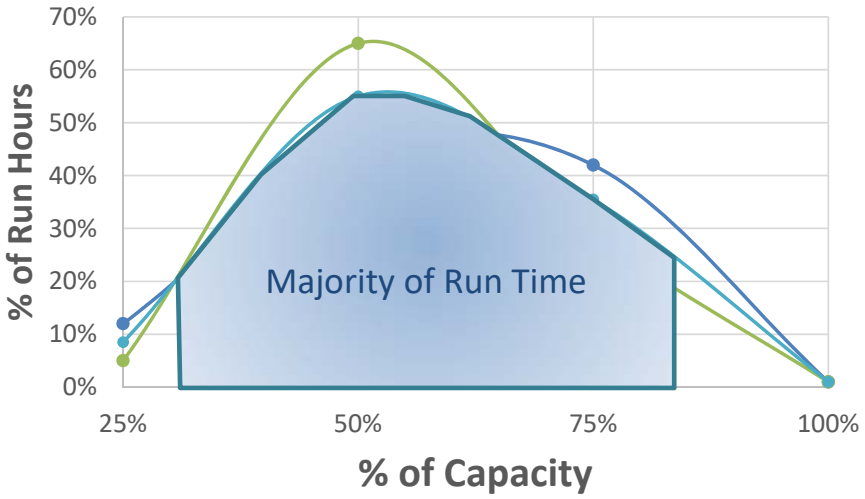
IPLV - Integrated Part Load Values

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-Chiller - Efficiency

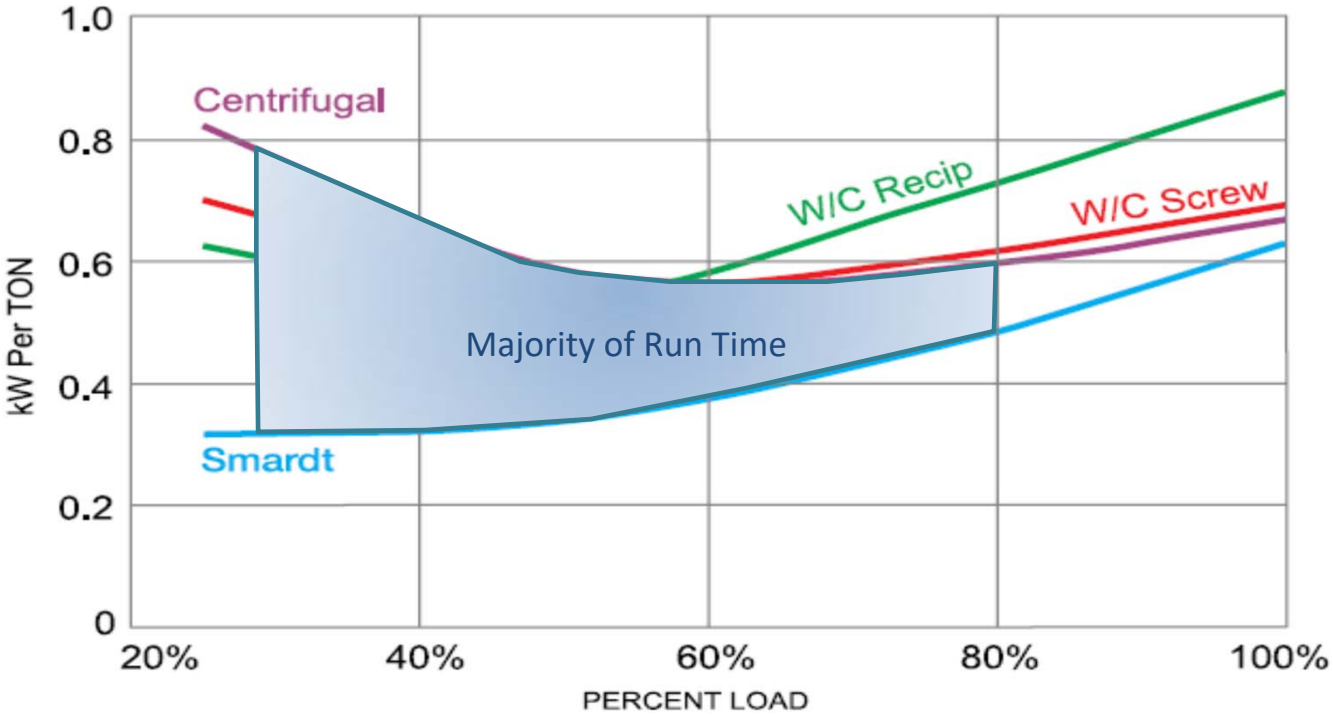
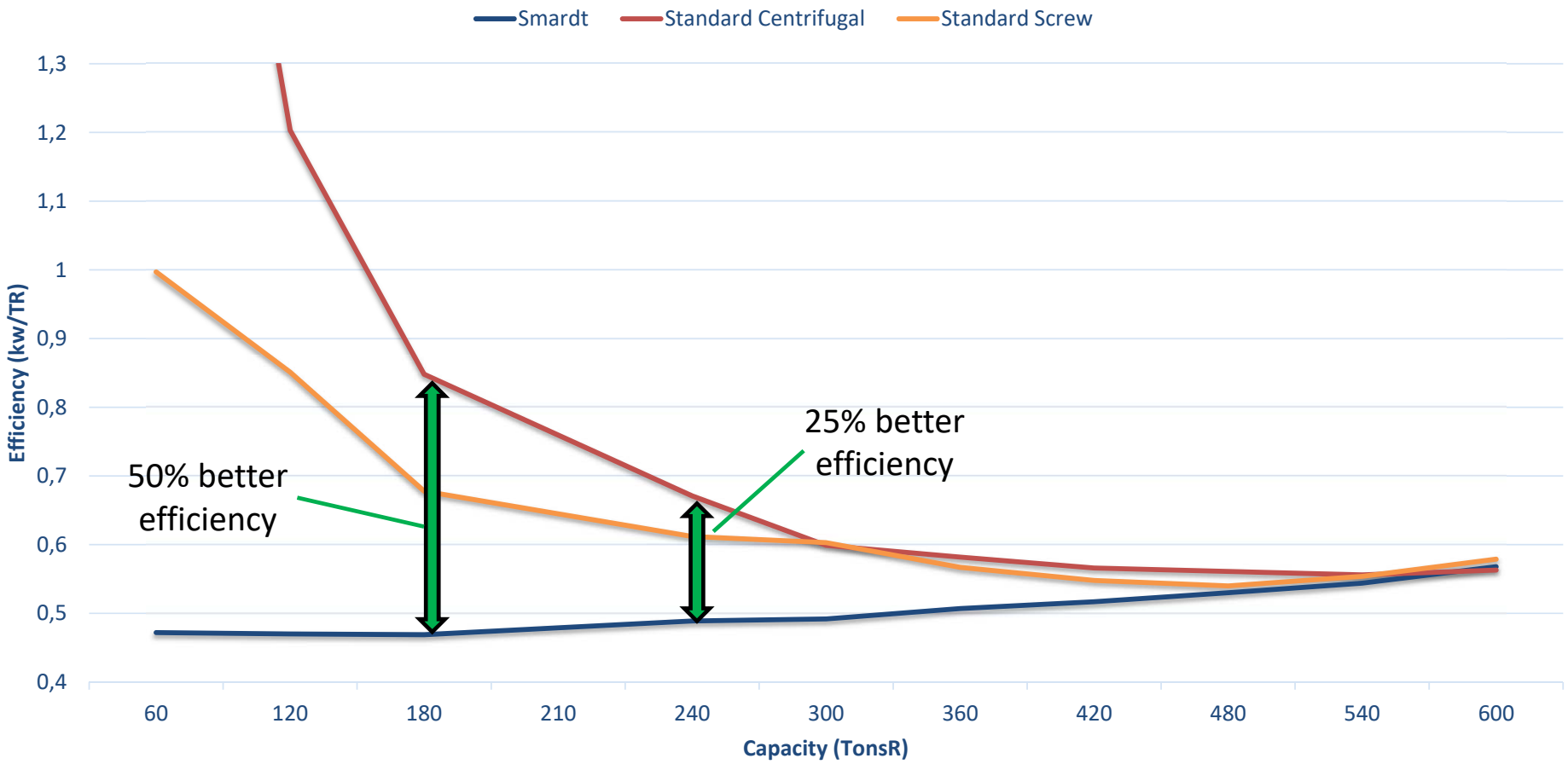


Diagram: Comparison uses generic industry performance data for 250TR water-cooled chillers (data source AHRI) with cooling tower relief

Smardt vs. Centrifugal vs. Screw

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



Smardt Chillers – Reliability

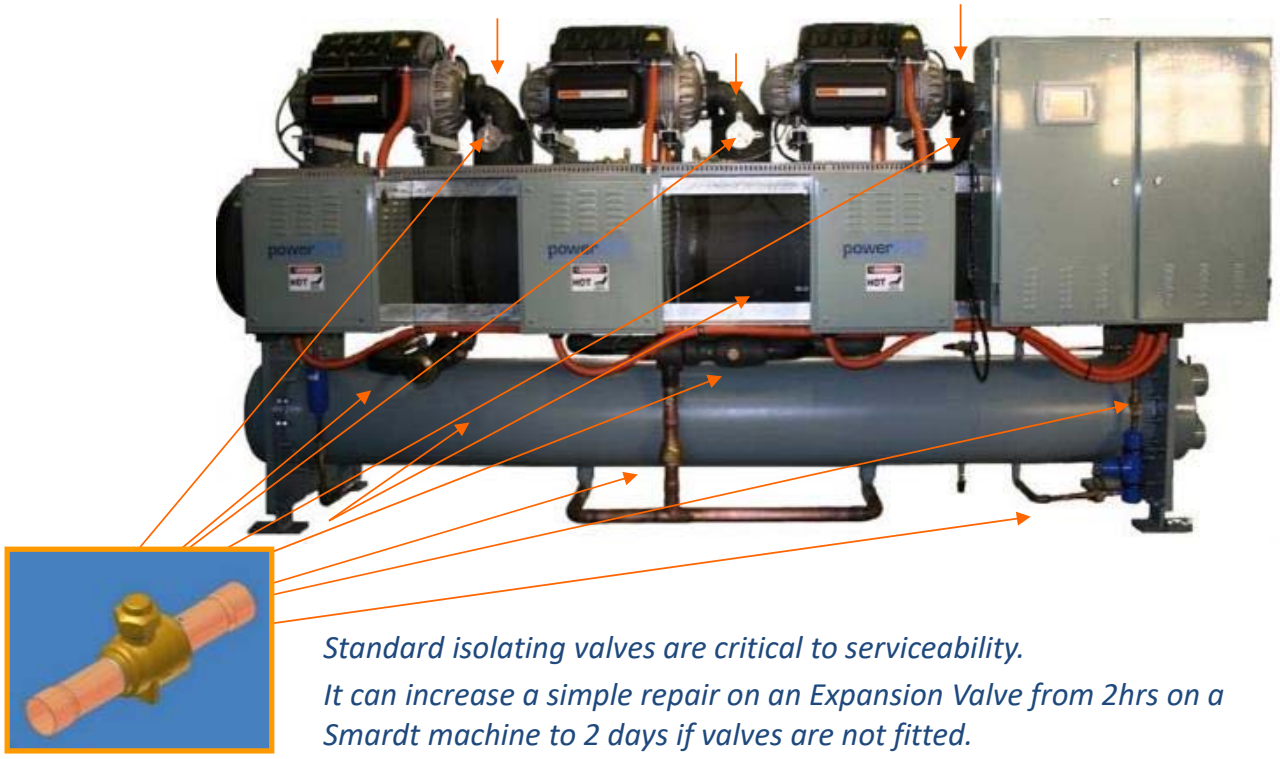
Redundancy in HVAC or Process cooling is critical

A compressor issue reduces chiller capacity to 0%

A compressor issue reduces chiller capacity to 75%

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.

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

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

Product References

TICA®

WHERE


Commercial


Industrial


Healthcare


Data Centers


Pharma


Government


Education


Hospitality


Transportation

Leading companies trust Smardt

Smardt Global References

Carnegie Hall, New York

Daimler Benz Germany

Chicago Mercantile Exchange

MY Oasis

Sydney Opera House

Governor's House, HK

Melbourne Cricket Ground

A few from more than 8000 chillers installed globally…

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 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 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
- Harvard University - USA

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 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 Airport / Airline Project References

- American Airlines - US
- Auckland International Airport - NZ
- Brisbane Airport – AU
- Gander International Airport – CA
- Gold Coast Airport - AU
- Houston Airport - US
- Lockheed Martin, TX, US
- Perth Airport – AU
- Singapore Airfreight Terminal 5 - SG
- Southern Air - US
- Stuttgart Airport (Flughafen Stuttgart) – EU
- United States Air Force Bases – Multiple Locations - US

District Cooling Case Studies

TICA®

Rochester NY District Cooling

Rochester Case Study

Site Info:

Eastman Business Park (EBP) located in Rochester, New York is a 1,200-acre R&D and manufacturing campus with over **16 million square feet of multi-scale manufacturing, distribution, lab and office space**. There are currently almost 110 companies onsite employing over 6,000 people, many of them responsible for the development of next-generation technologies in the areas of Energy Storage, Chemical Manufacturing, Roll-to-Roll Manufacturing and Photonics. The Park's immense manufacturing infrastructure—including the private utilities and onsite water and wastewater management system—is a competitive advantage for its high-use tenants.

Rochester Case Study

Project goal and decision making factor:

- To reduce energy
- RED evaluated several chiller technologies
- OFC is best choice due to energy efficiency, reliability, redundancy, low turndown ratio, which in turn also reduces the capital upfront cost and maintenance cost.
- Smardt is the only manufacturer capable of building a single 2000RT OFC machine.

Rochester Case Study (Phase 1)

Project details:

Phase 1: 1 x 2000RT V-Class Chiller

Model: WB600.5UG12.F2CDQB.F2CRQB.TS0

Chiller operating conditions:

CHW in/out: 43°F / 53°F

System configuration:

dedicated variable speed chilled water and condenser water pumps

Performance results:

From March-Aug 2019 operation the Smardt V-class chiller has achieved the following performance:

Avg load: 1222 tons

Max load: 2207 tons

Avg condenser water temp: 63°F

Min condenser water temp: 45°F

Avg chiller efficiency: 0.346 kW/ton

Best chiller efficiency: 0.141 kW/ton

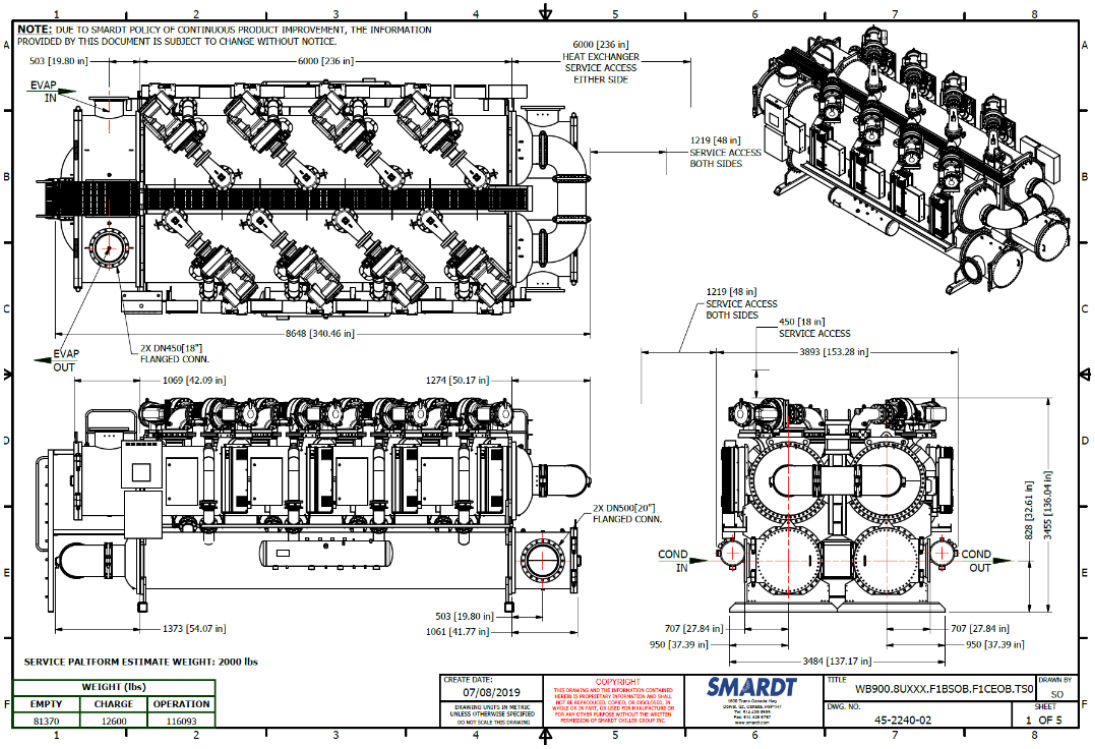
Rochester Case Study (Phase 2)

Project details:

Phase 2: 1 x 3000RT V-Class Chiller
(ordered in Aug 2019)

“Smardt’s energy efficiency was above and beyond other magnetic bearing chillers. The V-class oil-free centrifugal chiller can operate at extremely low condenser water temperatures to achieve world-class kW/ton values during wintertime operating conditions. Other manufacturers would have required costly additional features, tube enhancements, controls upgrades, etc. to approach the efficiencies offered by Smardt.”

-Craig A. Avalone, P.E., CEM, LEED AP
Energy Manager
RED-Rochester, LLC



University of Toronto District Cooling

U of T Case Study

Site Info:

University of Toronto is the Canada greenest employers in 2019 . U of T's Facilities includes the operation and stewardship of over $3.5 billion in physical assets at the St. George campus situated in the heart of Canada's largest city. They manage and provide service to over 120 buildings totaling 12 million square feet plus the operation and management of an extensive district energy system supporting more than 120 buildings.

U of T Case Study

Project details:

They have other large chillers for cooling but this new oil free 2400 TR chiller is part of their plan to reduce energy usage in this district cooling for years to come.

The whole project was designed and started with different models and configuration from 4 x units 600TR or modular chiller till we reach the most effective way is the V-CLASS chiller 2400 + Transformer.

University of Cincinnati District Cooling

U of C Case Study

Project details:

The University of Cincinnati is a public research university in Cincinnati, Ohio. Founded in 1819 as Cincinnati College, it is the oldest institution of higher education in Cincinnati and has an annual enrollment of over 44,000 students, making it the second-largest university in Ohio.

Smardt V-class was successful in winning the project because of its world-leading energy efficiency in addition to added redundancy from the multiple compressor design.

Chiller design conditions:

Model: WB800.6UG12.F1BEYB.F1BMYB.TX0

CHW in/out: 42°F / 53°F

IPLV: 0.32kW/ton

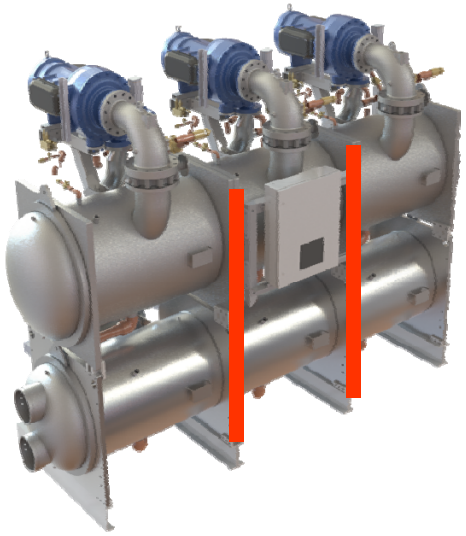
NPLV: 0.35kW/ton

Pennsylvania State Capitol Complex District Cooling

Penn State Capitol Complex

Project details:

This project was driven by an Energy Service Company (ESCO). Energy savings and breakdown capabilities of the chillers were the two main factors that piqued the interest of the customer. The existing chillers which needed to be replaced were in the basement and very difficult access. The modular construction of the Smardt chillers offered a solution that other chiller manufactures could not compete with.



CCUM ETS Montreal District Cooling

CCUM Montreal Case Study

Site Info:

- Second largest district cooling network in Canada
- More than 1.8 million m^2 in various infrastructures: office towers, shopping centres, hotels, a train station, a university campus and prestige apartments.
- ETS Facilities through CCUM district cooling engineering firm manage and provide services to over 50 buildings totaling 5 million sqft plus the operation and management of an extensive district energy system supporting more than 20 buildings in downtown core of Montreal.

CCUM Montreal Case Study

Project details:

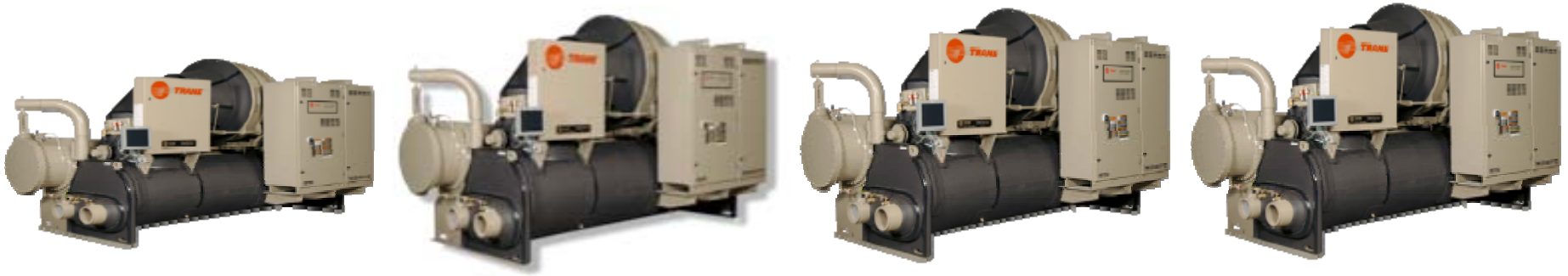
CCUM have other large chillers for cooling but this new oil free 2400 TR chiller is part of their plan to reduce energy usage in this district cooling for years to come.

The whole project was designed and started with different models and configuration from 4 x units 600TR or modular chiller till we reach the most effective way is the V-CLASS chiller 2400 + Transformer.

Singapore Case Study

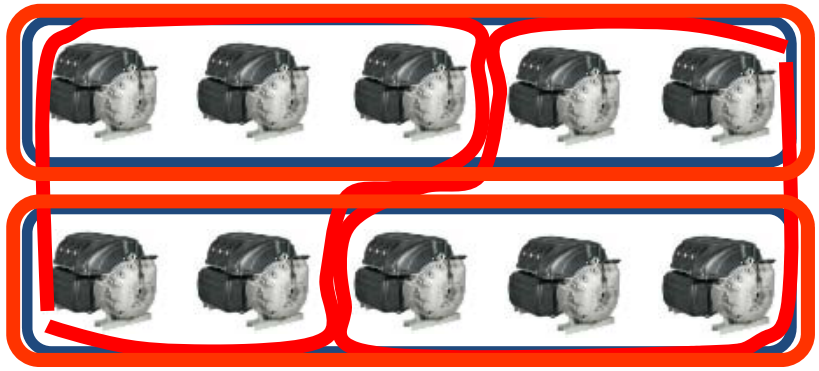
Plant Configuration – Before Retrofit

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

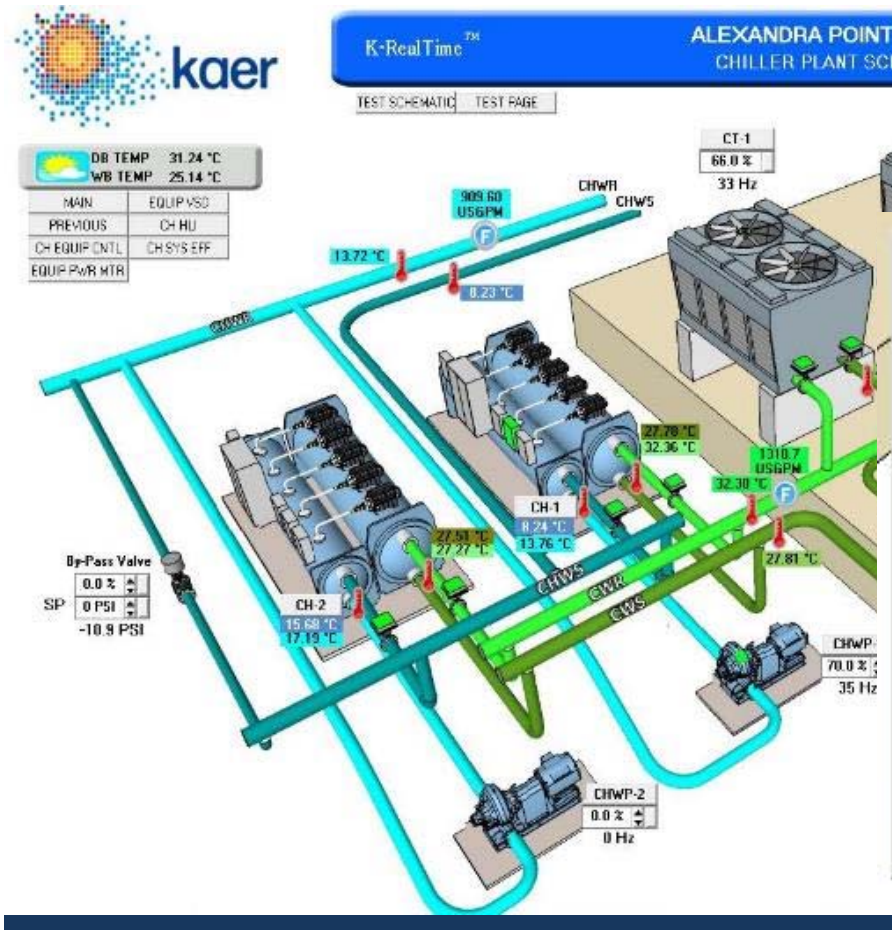


Plant Configuration – After Retrofit

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

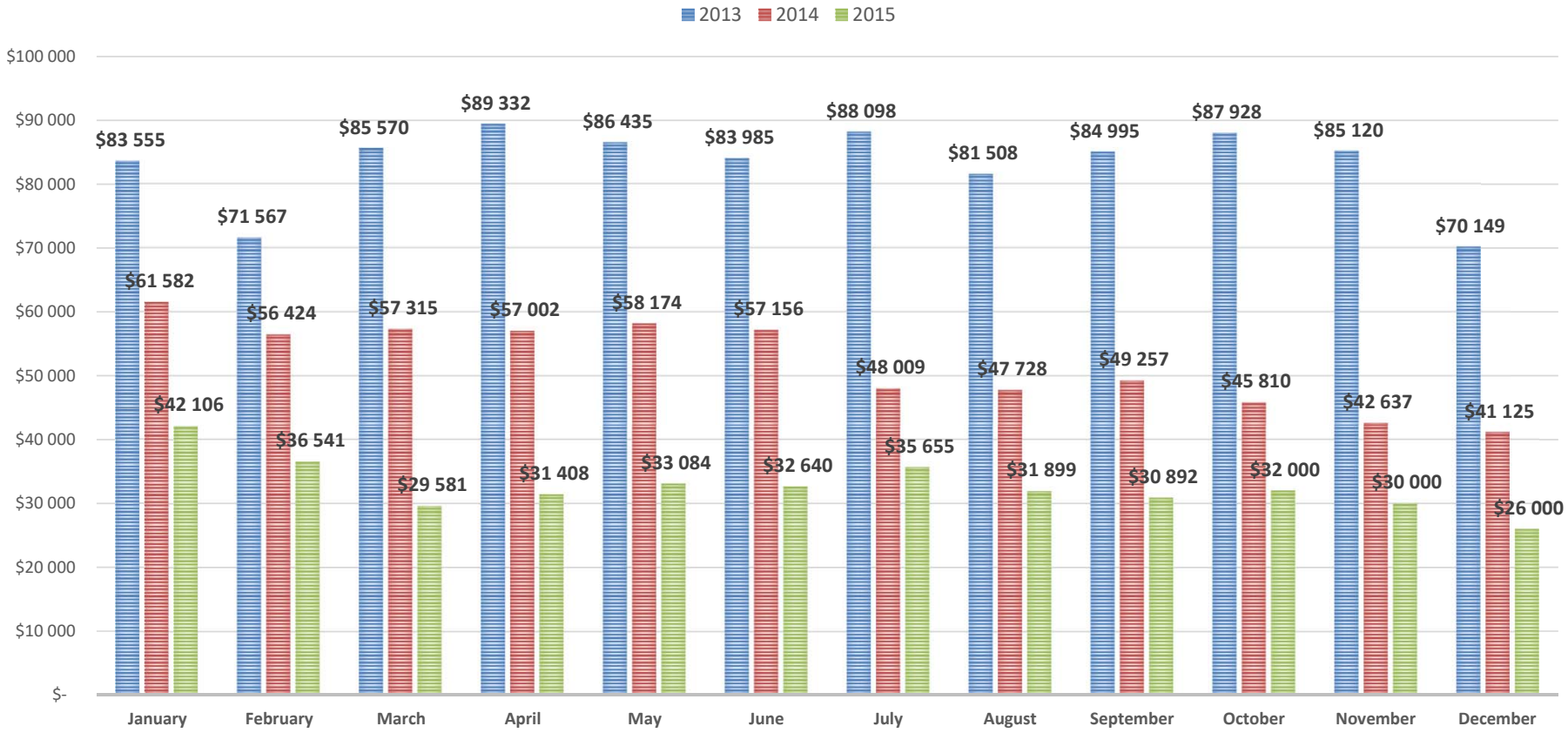


Measurement & Verification



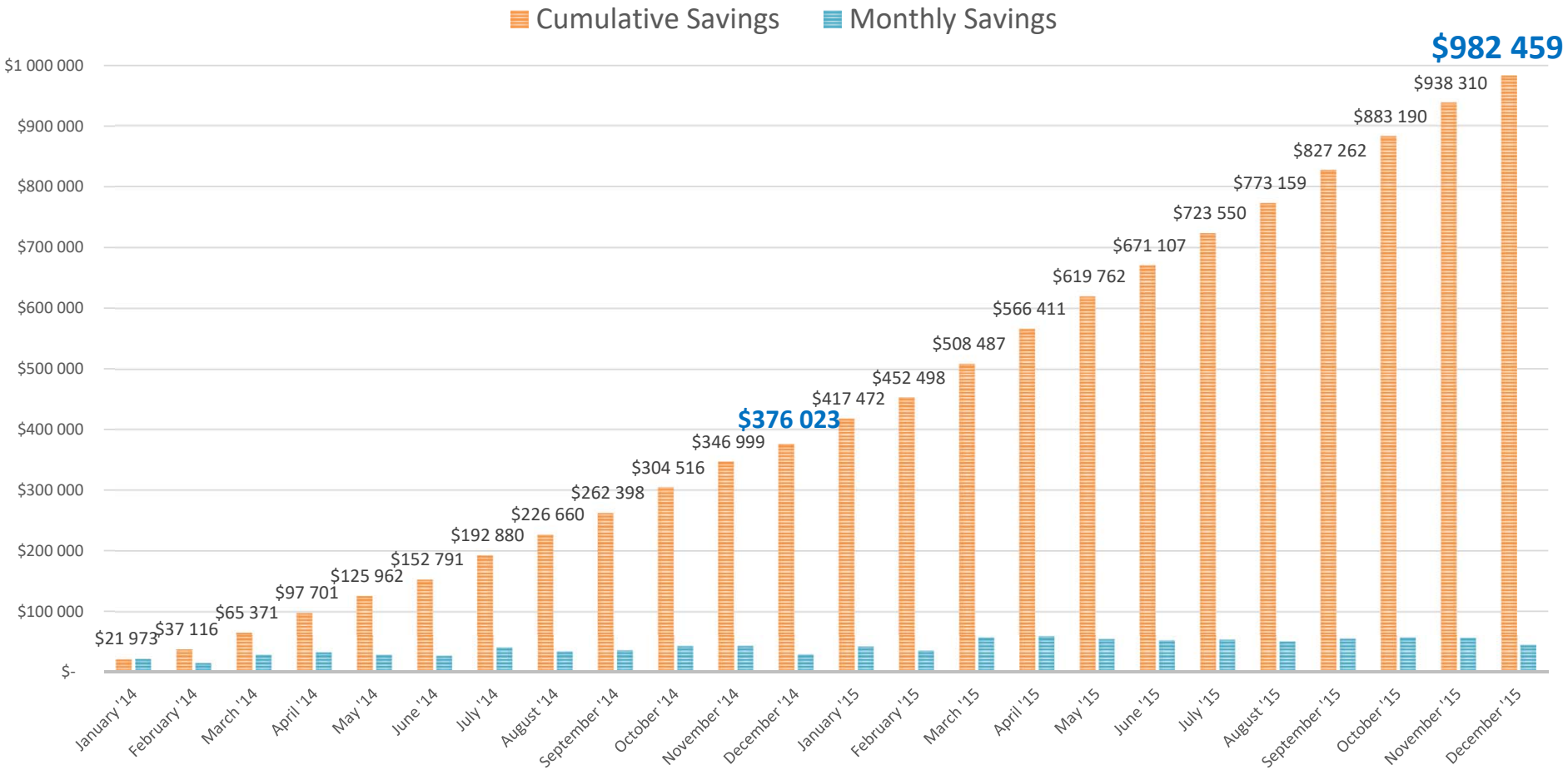
SYSTEM EFFICIENCY	
Chiller Efficiency KW/RT	0.501 KW/RT
CHWP Efficiency KW/RT	0.032 KW/RT
CWP Efficiency KW/RT	0.032 KW/RT
CT Efficiency KW/RT	0.034 KW/RT
System Cooling Load RT	374.6 RT
System Rejected Heat RT	441.9 RT
System Power KW	224.8 KW
System Total Efficiency	0.599 KW/RT
System Heat Balance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

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$



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

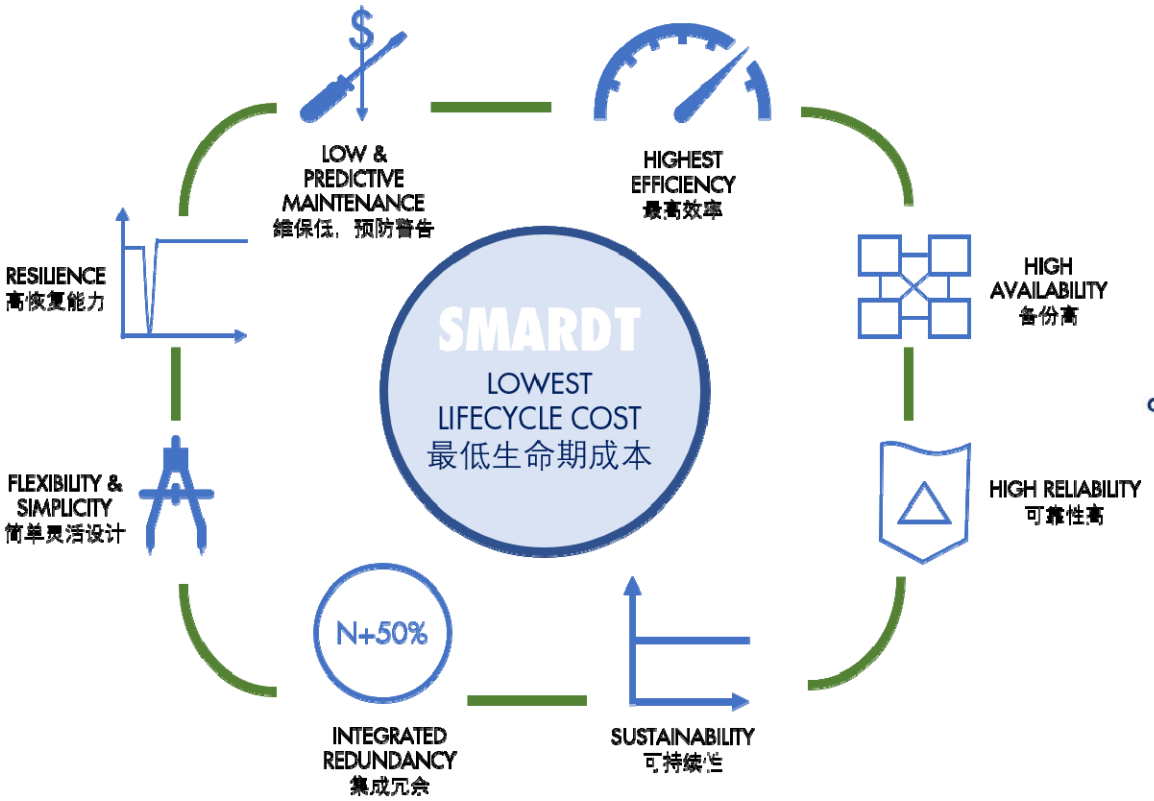
- 40% Reduction In Investment – 2 less chillers
- 40% Improvement In Plant Effiency
- 45% Reduction In Energy Used
- 17% Reduction In Potable Water Used
- 70% Reduction In Annual Maintenance Costs

Management Objectives

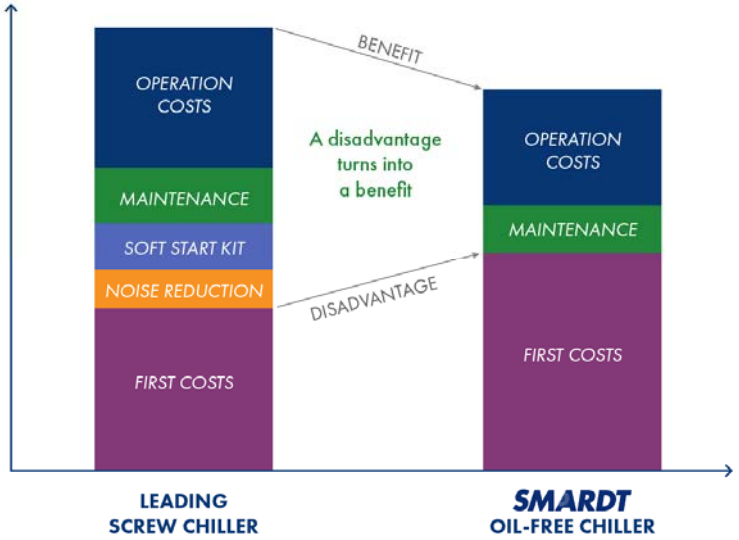
- Green Mark Platinum Achieved
- Exceptional ROI
- Cost Efficient
- Resource Efficient
- Improved Redundancy
- Improved Reliability

SMARDT

Lowest total cost of ownership



TOTAL COST IN 2 YEARS OF OPERATION
S. Diego



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

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