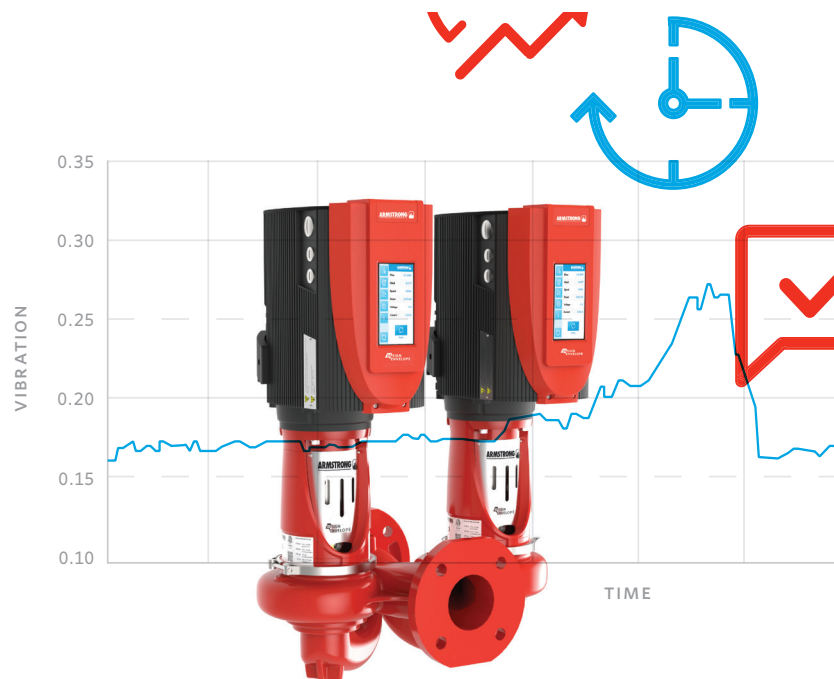


MANAGE YOUR SYSTEM



Performance Management Services Suite



ACTIVE PERFORMANCE MANAGEMENT™

FILE NO: 70.10
DATE: DECEMBER 2019

SUPERSEDES: 70.10
DATE: AUGUST 2019

OPTIMIZED EFFICIENCY
AND PERFORMANCE

ACTIVE PERFORMANCE MANAGEMENT™

LEARNS
PREDICTS
OPTIMIZES

With Active Performance
Management at the plant
level, you can save up to

40%

annual energy savings

Active Performance Management is a systems management approach that optimizes HVAC systems at any stage of a building's life-cycle by continuously learning from a broad network of installations and responding to changing HVAC requirements. The combination of smart commissioning with real-time alerts and system transparency addresses performance drift and maintains occupant comfort.

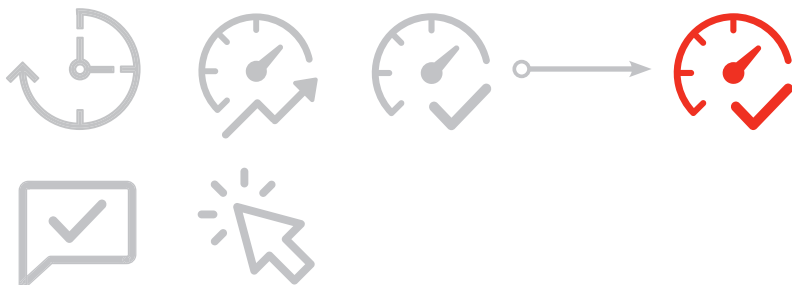


**PERFORMANCE MANAGEMENT AND SERVICES
FOCUSED ON MANAGING FOR PERFORMANCE**

PERFORMANCE MANAGEMENT SUITE

Performance Management Suite is one of five Armstrong Fluid Technology's service suites that enable Active Performance Management. The services included in Performance Management Suite work at the equipment, sub-system or system level to eliminate costly energy drift and maximize system uptime.

Drawing on data aggregated from a connected network of systems and combining this with advanced cloud analytics, Performance Management Services deliver actionable insights seamlessly into other building management systems, enabling building operators to make informed capital or operation decisions that drive better return on investments.

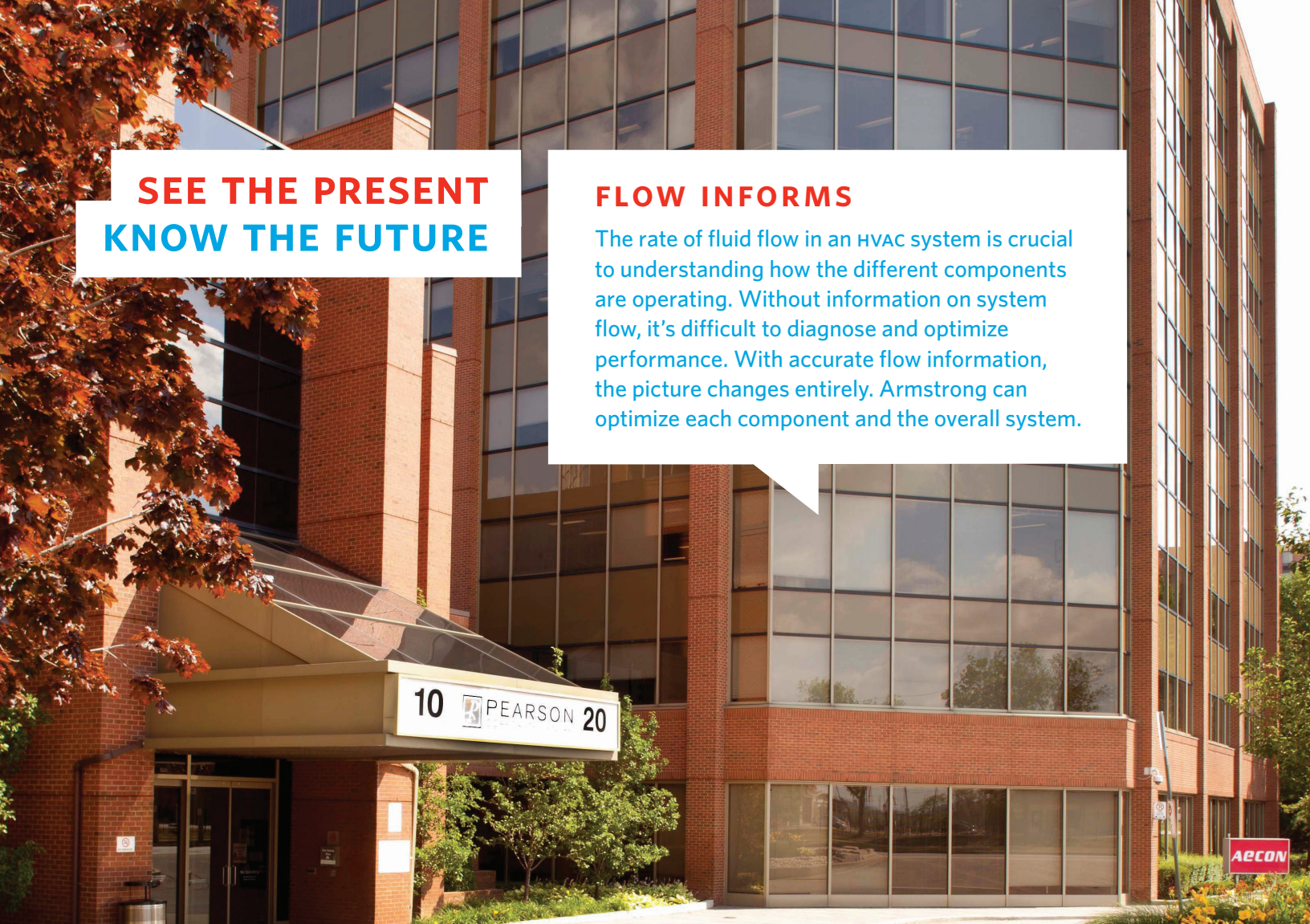


Performance Management Suite is one of five service suites that enable Active Performance Management

**SEE THE PRESENT
KNOW THE FUTURE**

FLOW INFORMS

The rate of fluid flow in an HVAC system is crucial to understanding how the different components are operating. Without information on system flow, it's difficult to diagnose and optimize performance. With accurate flow information, the picture changes entirely. Armstrong can optimize each component and the overall system.



CASE STUDY | Carlson Court

ANNUAL ENERGY SAVINGS



87%

Armstrong replaced six constant speed pumps with new Vertical In-Line pumps. Combining Design Envelope technology and Pump Manager, Armstrong optimized pump operations for annual energy savings of 87%.



FACILITY TYPE
Large Office Complex



LOCATION
Toronto, Canada



SIZE
300,000 ft²

ANNUAL ENERGY COST



BEFORE	AFTER
\$140,072	\$18,380
CAD	CAD
AVERAGE	AVERAGE

ANNUAL COST SAVINGS **\$121,692** CAD

CO₂ EMISSIONS



BEFORE	AFTER
150,847	19,794
kg CO ₂	kg CO ₂
AVERAGE	AVERAGE

ANNUAL CO₂ EMISSION REDUCTION **131,053** kg CO₂

MANAGE YOUR PUMP

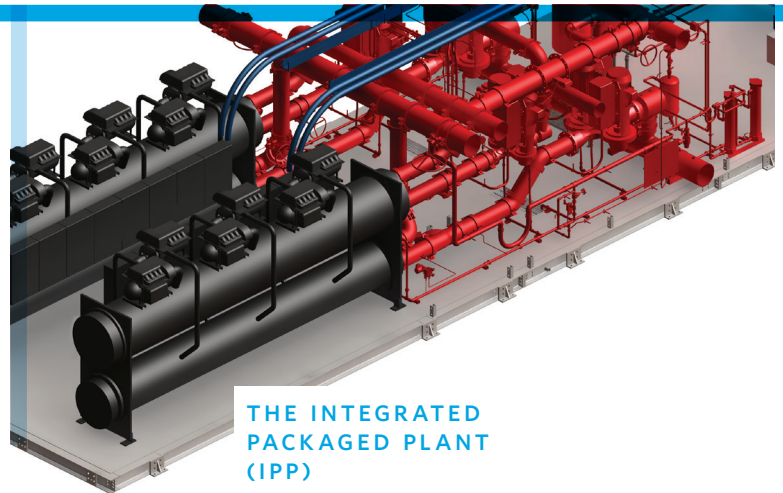
Pump Manager is a Cloud-based service that will help you optimize pump performance



THE
TANGO™

MANAGE YOUR PLANT

ECO*Pulse™ is a cloud-based service that will help you optimize chilled-water plant performance



THE INTEGRATED
PACKAGED PLANT
(IPP)

**WITH TWO PERFORMANCE
MANAGEMENT SUITE
SERVICES:**

Ongoing tracking, analysis and benchmarking of HVAC performance

Deeper insights into HVAC operation for informed decision making

Data-driven optimization in response to system changes

Long-term mechanical system efficiency

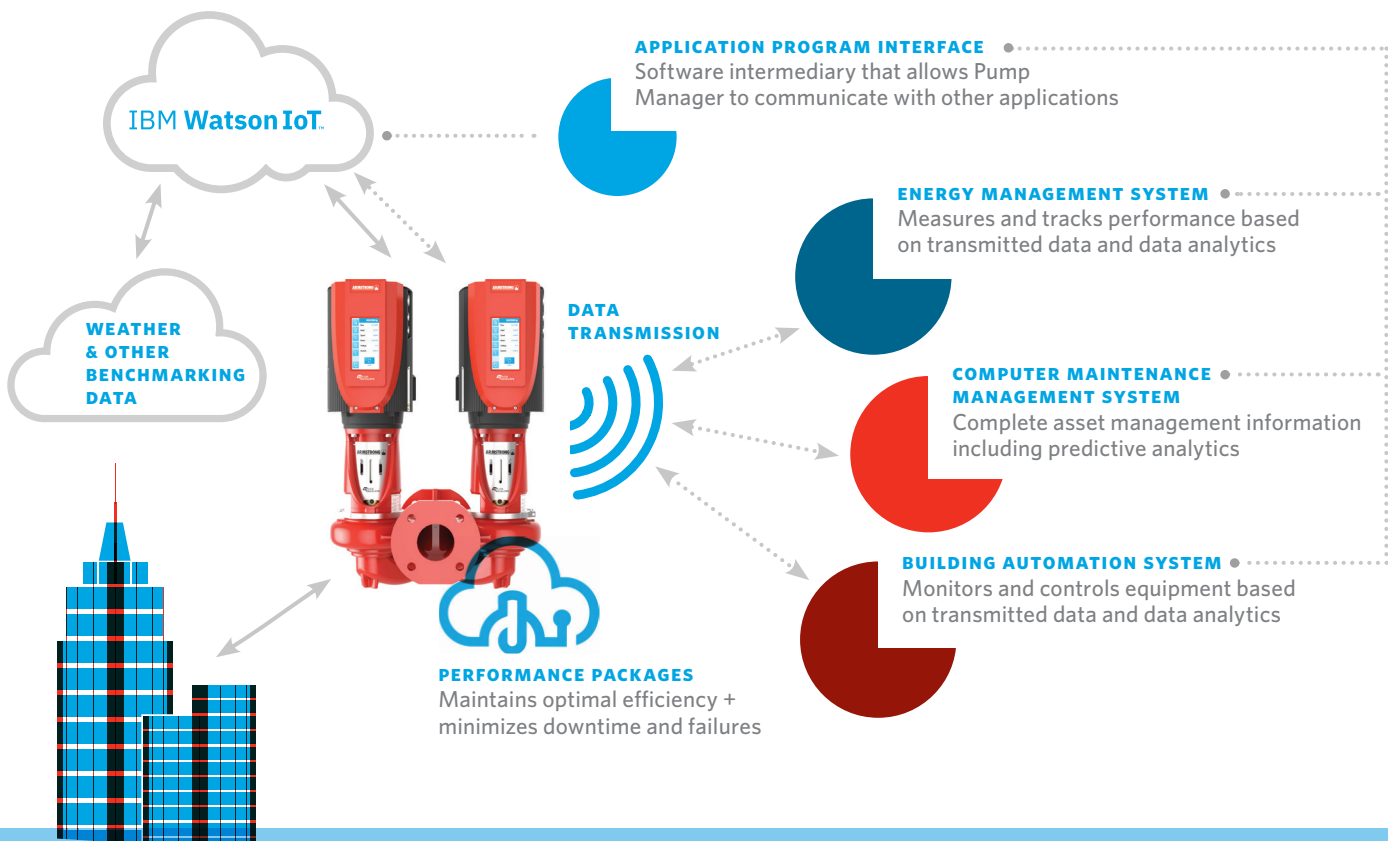
Built in complete asset life cycle management capability



PUMP MANAGER

Pump Manager is a cloud-based subscription service that tracks pump performance and provides early diagnostic warnings, trends, analysis and automated reports. With Pump Manager, customers can make informed decisions based on real-time data

and take action as needed. Through connections to existing BAS, CMMS and EMS systems, Pump Manager enables Active Performance Management, leveraging deep analytics to provide greater predictive accuracy and even greater HVAC efficiency.



LEARNING ON TWO LEVELS

Sustained optimization and smart commissioning requires in-depth knowledge of HVAC systems. To gain this knowledge and perspective, Armstrong relies on two modes of learning:

- ① Learning based on static maps of component performance profiles
- ② Learning generated through adaptive mapping capabilities that gather data from the environment and from a network of installations.

KEY BENEFITS

Reduce operating costs

Continuously optimize equipment operation and eliminate energy drift to realize up to 30% in pump energy savings

Make informed capital investment decisions

Use the insights derived from flow trends to make informed capital investment choices and avoid investment lock-in risk

Improve building resilience

Actively manage pumping and fluid flow systems for sustained building resiliency

Increase system uptime and reliability

Reduce unexpected failures

Predict rather than react to manage and mitigate risks of equipment failure and realize 48% to 51% in savings

Improve tenant comfort

Keep fluid flow in the desired range and reduce temperature swings

Improve transparency

Have visibility into equipment operation, energy savings and the impact on carbon footprint

KEY FEATURES

Real-time insights and alerts

Excessive vibration

Broken coupling

Pump in hand

Dead head

Cavitation

Performance reports

Current operating state relative to design

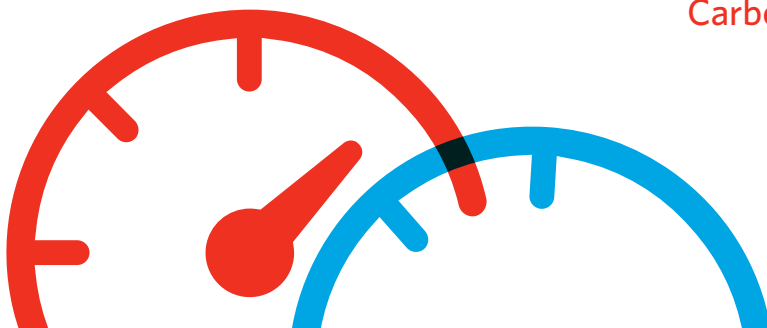
Flow and head relationships

3-D pump vibration

Flow profile

Energy consumption profile

Carbon footprint



ECO*PULSE™

ECO*PULSE™ is a Cloud-based Performance Management Service for your cooling systems that combines real-time, automated diagnostics of your system with quarterly expert review — while working with your Integrated Plant Controller or OPTI-VISOR™ to help you maintain optimal performance.

EXAMPLE SYSTEM

2000 tons cooling at 50% average load
\$0.10/kWh power cost

SEASONAL COOLING

2000 ton cooling system
3840 run hours/year (16 hour/day × 30 days × 8 months)
50% average load on cooling system when running
\$0.10/kWh cost of power

0.03 kW/ton difference in efficiency

**= \$11,500 savings/year
using ECO*PULSE™**

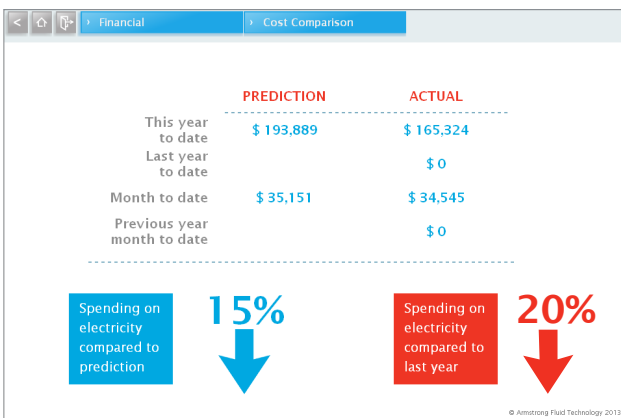
Note! These calculations do not factor in reductions in maintenance spending or the added value of improved uptime

BASELOAD COOLING

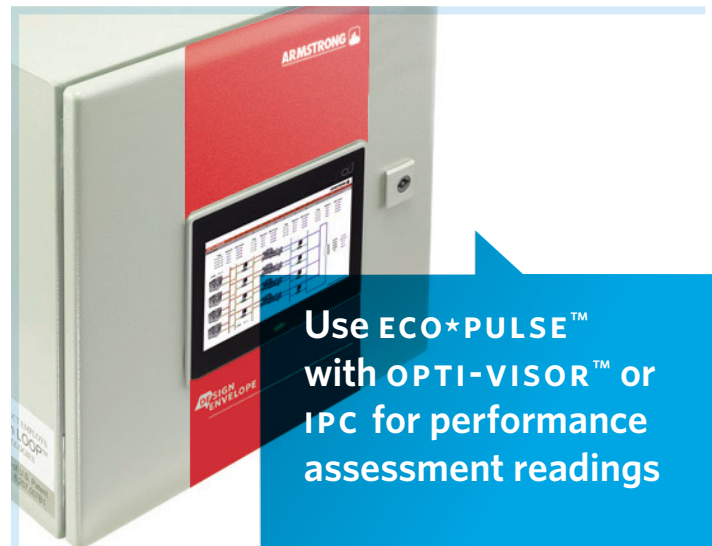
2000 ton cooling system
7000 run hours/year (20 hours/day × 365 days)
50% average load on cooling system when running
\$0.10/kWh cost of power

0.03 kW/ton difference in efficiency

**= \$21,000 savings/year
using ECO*PULSE™**



A high-level summary of financial results for month-to-date and year-to-date comparisons



Use ECO*PULSE™ with OPTI-VISOR™ or IPC for performance assessment readings

KEY BENEFITS

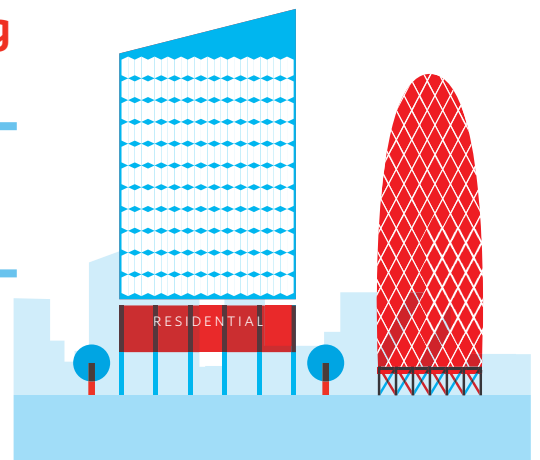
Spend less on energy

Optimize your maintenance programs

Devote fewer resources to understanding and managing your cooling system

Be advised of actions required to remedy performance issues in your plant

Enjoy more reliable cooling performance



KEY FEATURES

Performance assessment

24-7 assessment of your cooling system relative to real-time performance expectations for your building and local climate

Standards compliant

Long-term operating data collection in compliance with the expectations and building performance standards of ASHRAE 189.1

Daily notifications

Daily and/or real-time e-mail notifications with advice to help identify root causes of performance issues

Quarterly reports

In-depth quarterly reports with actionable recommendations for preventive maintenance and operating changes

Evaluation

Easily digestible, insightful evaluation of equipment and system performance

Reviews

Regular review of your systems and operating data by industry experts

Ask your Armstrong Representative about the entire family of five service suites that enable Active Performance Management:



MANAGE YOUR SYSTEM



PERFORMANCE MANAGEMENT SUITE

Pump Manager

ECO*PULSE



UPGRADE YOUR SYSTEM



PERFORMANCE UPGRADE SUITE

Pump Retrofit

Upgrade legacy pumps

Upgrade Booster package

OPTI-VISOR

TOWERMAX



GET IT RIGHT



STARTUP SUITE

Expert planning and design services

Managed system startup

Smart Commissioning



BOOST YOUR UPTIME



MAINTENANCE, OPERATIONS, REPAIRS SUITE

Replacement parts

Emergency services

Service agreements



UNDERSTAND THE POSSIBILITIES



CONSULTING SUITE

Pump energy consulting

Booster energy consulting

Plant energy consulting



OUR SUSTAINABILITY VISION



PLANET PROPOSITION

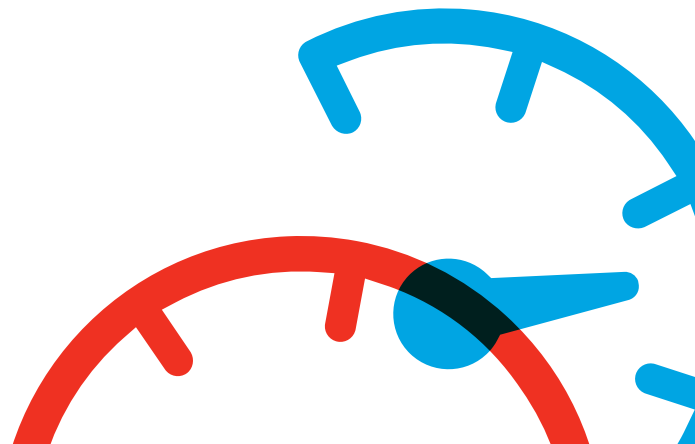
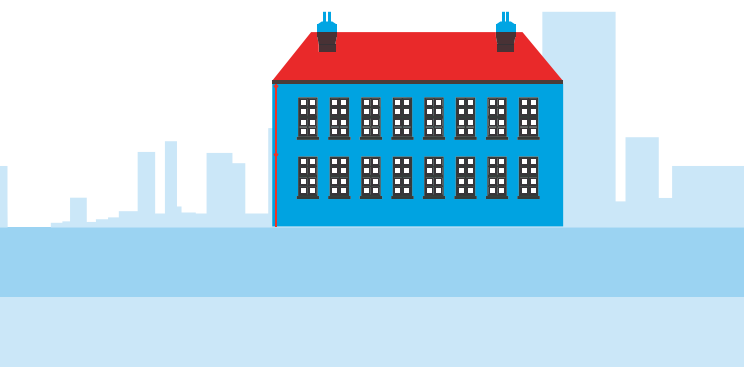
Through our Planet Proposition charter, Armstrong has committed to minimizing our impact on the environment. Around the world, Armstrong's Planet Proposition teams have taken on projects that are helping us meet our targets. Two examples of ongoing projects are:

2 BY 22

Armstrong is committed to helping existing customers reduce GHG emissions of installed equipment by two million tons by the year 2022. Under this initiative, Armstrong works with customers to upgrade existing installations and continues to develop new energy-savings solutions.

NET ZERO CARBON BUILDINGS COMMITMENT

The Net Zero Commitment positions energy efficiency as a central component to achieving decarbonization globally. In signing the Net Zero Carbon Buildings Commitment, Armstrong has pledged to ensure our entire portfolio of buildings operates at net zero carbon by the year 2030.



TORONTO

23 BERTRAND AVENUE
TORONTO, ONTARIO
CANADA, M1L 2P3
+1 416 755 2291

BUFFALO

93 EAST AVENUE
NORTH TONAWANDA, NEW YORK
U.S.A., 14120-6594
+1 716 693 8813

BIRMINGHAM

HEYWOOD WHARF, MUCKLOW HILL
HALESOWEN, WEST MIDLANDS
UNITED KINGDOM, B62 8DJ
+44 (0) 8444 145 145

MANCHESTER

WOLVERTON STREET
MANCHESTER
UNITED KINGDOM, M11 2ET
+44 (0) 8444 145 145

BANGALORE

#59, FIRST FLOOR, 3RD MAIN
MARGOSA ROAD, MALLESWARAM
BANGALORE, INDIA, 560 003
+91 (0) 80 4906 3555

SHANGHAI

UNIT 903, 888 NORTH SICHUAN RD.
HONGKOU DISTRICT, SHANGHAI
CHINA, 200085
+86 (0) 21 5237 0909

SÃO PAULO

RUA JOSÉ SEMIÃO RODRIGUES AGOSTINHO,
1370 GALPÃO 6 EMBU DAS ARTES
SAO PAULO, BRAZIL
+55 11 4785 1330

LYON

93 RUE DE LA VILLETTE
LYON, 69003 FRANCE
+33 (0) 420 102 625

DUBAI

JAFZA VIEW 19, OFFICE 402
P.O. BOX 18226 JAFZA,
DUBAI - UNITED ARAB EMIRATES
+971 4 887 6775

MANNHEIM

DYNAMOSTRASSE 13
68165 MANNHEIM
GERMANY
+49 (0) 621 3999 9858

ARMSTRONG FLUID TECHNOLOGY
ESTABLISHED 1934

ARMSTRONGFLUIDTECHNOLOGY.COM

.....

For more information, contact your
Armstrong representative or visit us at
ArmstrongFluidTechnology.com/ContactUs

MAKING
ENERGY
MAKE
SENSE™