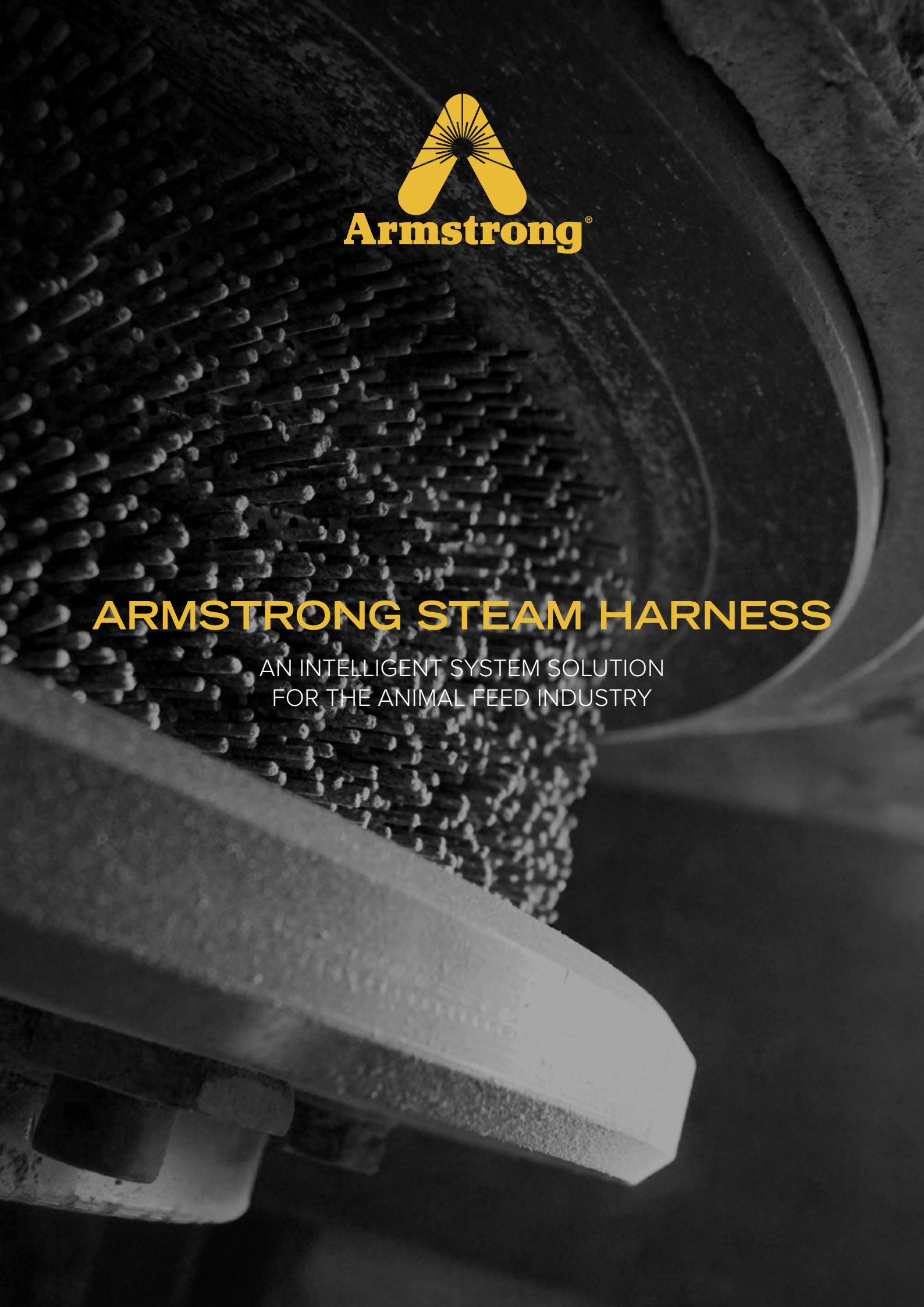


ARMSTRONG STEAM HARNESS

AN INTELLIGENT SYSTEM SOLUTION
FOR THE ANIMAL FEED INDUSTRY

GLOBAL EXPERTISE FOR THE AGRI-FEED SUPPLY CHAIN

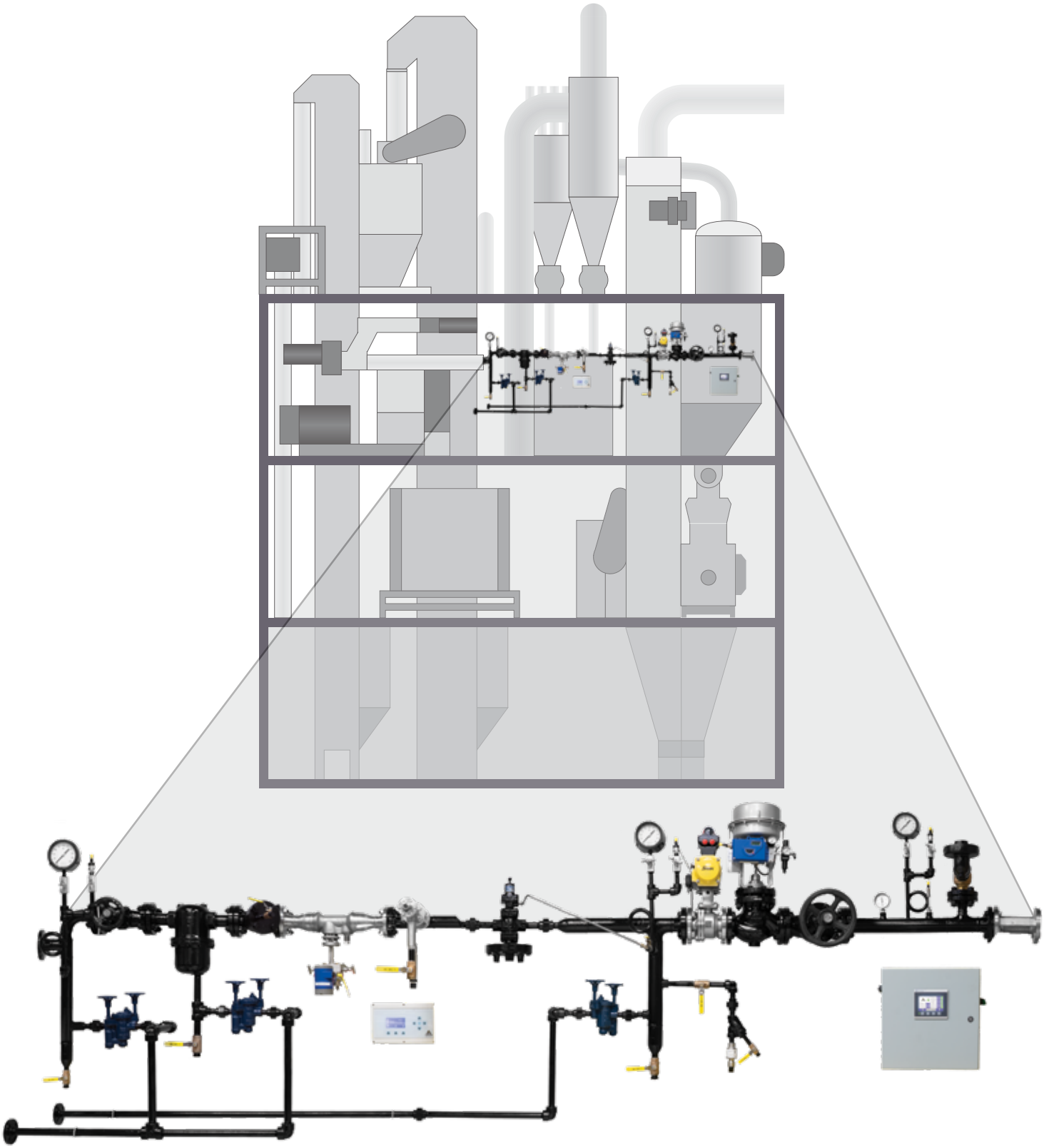
ARMSTRONG CAN SATISFY YOUR INDUSTRY'S TOUGHEST CHALLENGES

As global leaders in steam and condensate system management, Armstrong understands the complex issues you face every day. We have a worldwide network of resources, and more than a century of in-depth knowledge and experience, all devoted to improving efficiency, reducing energy use, and lowering costs for your organization. Solving your problems and making things easier for you is the reason we're here.

ABOUT ARMSTRONG INTERNATIONAL

Founded in 1900, Armstrong International is a privately held, fifth-generation, family-owned company. Our unique heritage of knowledge, experience and insight reaches back more than a century, enabling us to serve you in ways no one else can. Often the first to market, Armstrong invented the inverted bucket steam trap and our company has been granted more than 70 patents on exceptional products, technology and software.

Today, Armstrong's industry-leading equipment is hard at work in more than 100 countries, saving time money and energy for companies like yours.



ARMSTRONG STEAM HARNESS IS CUSTOMIZED TO SATISFY THE UNIQUE REQUIREMENTS OF YOUR INDUSTRY AND FACILITIES

We use a holistic, system approach that takes your entire plant into consideration. Our experts will design your Armstrong Steam Harness for ideal placement, ergonomics and operator safety within your facilities.

ENGINEERED FOR PRODUCTIVITY, EFFICIENCY, PERFORMANCE AND ENERGY SAVINGS

BOOST YOUR PRODUCTION AND YIELD, REDUCE STEAM CHOKES, AND CUT YOUR PRODUCT REJECTION RATE WITH ARMSTRONG STEAM HARNESS

Our comprehensive system solution combines Armstrong's dependable, long-lasting products and our state-of-the-art technology to reliably deliver the quality of steam your plant needs for a higher level of performance and efficiency.

ARMSTRONG STEAM HARNESS IS BUILT TO SOLVE YOUR PROBLEMS AND PREVENT THEM.

- Fewer steam chokes and improved steam quality result in increased throughput and less reprocessing
- Ensure proper condensate drainage and delivery of dry, measurable, quality steam to pellet mill or extruder
- Allocate thermal cost and performance per formula; in certain cases, correlate with pelleting and extrusion parameters
- Increase safety and reduce energy loss with thermal insulation blankets that can be removed for maintenance and then reused

PAIN POINTS STEAM CHOKE PELLET MILL EXAMPLE:

- Pellet mill producing 35 ton per hour
- 4 hours maintenance usually needed to put it back in operation after a steam choke
- 3 to 4 persons required to clean the unit
- Loss of time and production yield
- Considering average feed price 300 € per ton
- Loss of revenue up to 42 000 €

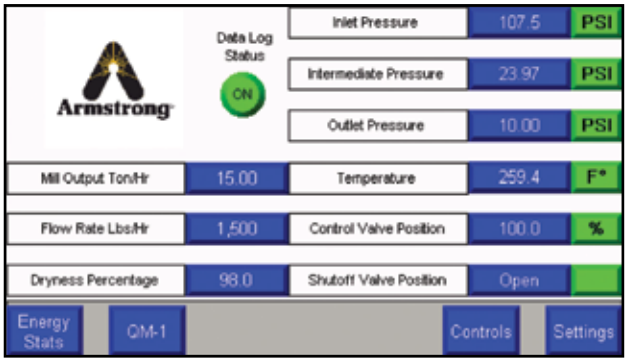
MONITORING AND MEASURING IN REAL TIME

MAKE SMARTER, QUICKER DECISIONS BASED ON ACCURATE, UP-TO-DATE INFORMATION

Armstrong Steam Harness gives you real-time access to key parameters using the Human Machine Interface (HMI) with Programmable Logic Controller (PLC).

PRECISE CALCULATION OF STEAM HARNESS PARAMETERS

By linking information from pellet mill or extruder to steam quality and flow, Armstrong Steam Harness allows you to determine optimum steam capacity and quality for a given formula.



Key parameters using HMI with PLC

Quick, easy access to key parameters
Steam pressure upstream of Armstrong Steam Harness
Steam quality
Steam quality (average) per ton feed
kg of water added by steam per ton feed
Steam consumption per hour
Steam consumption per ton feed
Accumulated steam consumption (lb or kg)
Thermal energy input (MMBtu/h or kW)
Thermal energy per ton feed (MMBtu or kW/h)
Steam cost per hour (local currency)
Steam cost per ton feed (local currency)
Motor amps per ton feed (amp/ton feed)
Motor amps per steam flow
Reduced steam pressure for feed conditioning
Customization of Armstrong Steam Harness per formula**

* Production rate (4-20mA electrical signal) from pellet mill or extruder is required for tonnage

** Information required from pellet mill manufacturer via EthernetIP

SAGE® STEAM SYSTEM MONITORING, MEASURING AND REPORTING

SAGE® keeps you fully informed, 24 hours a day with regular updates, precise documentation, custom-filtered reports, and real-time alerts notifying you of any problems. This powerful software calculates steam loss data and reports it using Armstrong's proprietary, UNFCCC-approved, steam system efficiency methodology.

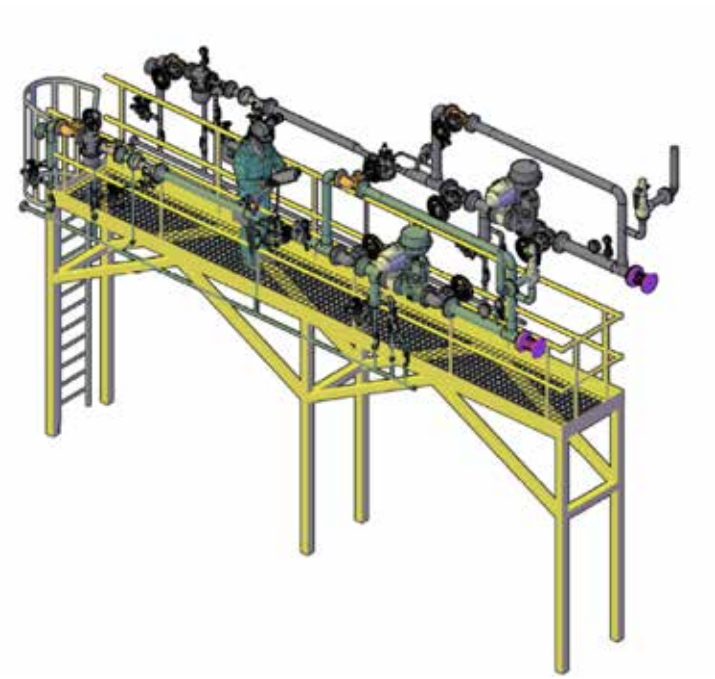
SAGE® is engineered to be a fully integrated part of your steam system.It works seamlessly with our real-time monitoring products (SteamEye® and AIM®), ensuring that it always has access to the most current data.

The SAGE UMT™ is a wireless hand-held steam trap testing tool. The SAGE UMT™ uses a state of the art piezo electric acoustic sensor developed and tuned specifically for the unique conditions found in steam traps. The acoustic sensor coupled with a non-contact infrared temperature sensor makes testing steam traps as simple as pressing a button.

SKILLED SERVICE AND SUPPORT—BEFORE, DURING AND AFTER INSTALLATION

MECHANICAL AND PIPING CUSTOMIZATION OF ARMSTRONG STEAM HARNESS, AD HOC TO YOUR SPECIFIC REQUIREMENTS

Every pellet mill or extruder, whether new or existing, has unique piping configurations and mechanical support requirements, so Armstrong begins by doing an on-site assessment. We measure your physical space, identify restrictions, and determine the specific needs of your facilities surrounding the pellet mill or extruder before customizing your Armstrong Steam Harness for your existing infrastructure.



OUR THERMAL EVALUATION HELPS TO ENSURE THE PERFORMANCE OF YOUR ARMSTRONG STEAM HARNESS

Having a steam and condensate system that is in excellent working order is essential to the performance of your Armstrong Steam Harness. By evaluating your plant's thermal infrastructure, Armstrong's specialists are better equipped to improve your steam distribution and maximize the quality and quantity of steam supplied to the conditioner and/or preconditioner chamber.

FROM ON-SITE AUDIT TO TURNKEY INSTALLATION AND ONGOING EXPERT SERVICE, ARMSTRONG CAN DO IT ALL

Armstrong's thermal engineering specialist will be with you before, during and after the installation of your Armstrong Steam Harness to make sure that the commissioning process is a smooth and pleasant experience. We consistently focus on safety for your operators, ergonomics, and ensuring that your pellet mill or extruder receives the optimum quality and quantity of steam.

WE WANT YOU TO ENJOY WORKING WITH ARMSTRONG

Armstrong is here to solve your problems and make your life easier. We become an integral part of your team, consistently delivering on our promises and exceeding your expectations while remaining transparent and simple to do business with. We want working with us to be an experience you enjoy, every single time.

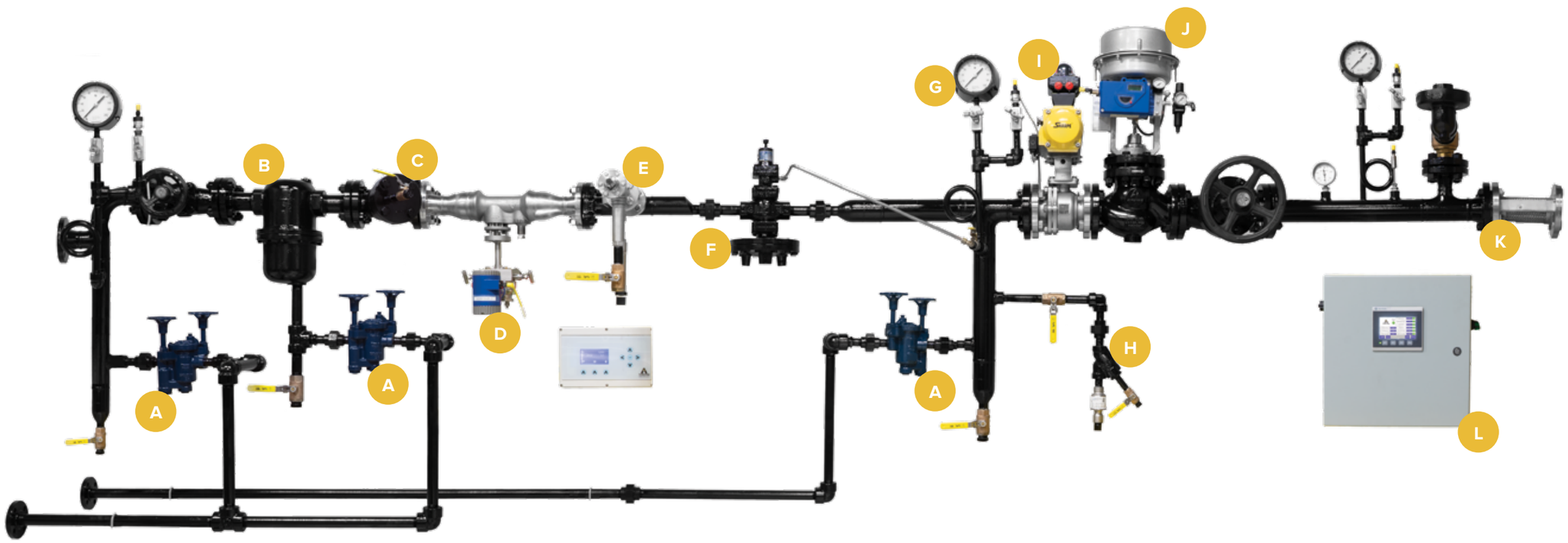
ARMSTRONG STEAM HARNESS IS A COMPLETE, FULLY INTEGRATED SYSTEM PACKAGE

IMPROVE STEAM QUALITY AND SYSTEM PERFORMANCE IN YOUR NEW FACILITIES AND EXISTING PLANTS OF ALL SIZES, WORLDWIDE

Armstrong Steam Harness combines best-in-class quality, unparalleled value and a level expertise that only Armstrong can provide. The rugged, dependable products and cutting-edge technology in this comprehensive system package are all designed to work together as they consistently deliver an outstanding performance and a superior return on your investment.

HOW ARMSTRONG STEAM HARNESS WORKS

1. Plant steam enters **Armstrong Steam Harness**.
2. Manual butterfly valve at inlet provides complete isolation, as needed.
3. The **Armstrong Steam QM®-1** sensor can be relocated to available nozzle, as needed, to measure steam quality upstream of Armstrong Steam Harness.
4. Drip leg captures condensate and dirt from plant steam distribution; **Armstrong TVS inverted bucket steam trap** drains condensate from drip leg; high pressure condensate return valve allows manual removal of particles captured by drip leg. **(A)**
5. **Drain separator** removes moisture and particles greater than 10 microns from steam; Armstrong TVS inverted bucket steam trap drains condensate from drain separator; high pressure condensate return. **(B)**
6. Visual pressure gauge and pressure transducer installed at the top of separator translates inlet steam pressure and transmits signal to PLC/HMI supplied by Armstrong.
7. Steam passes through **Y-type strainer** that captures particles greater than 0.0055”; valve allows manual removal of particles; dirt goes to atmospheric discharge. **(C)**
8. **VERIS Accelabar®** measures steam flow and compensates for changes in steam pressure, signal transmitted to pellet mill or extrusion control system. **(D)**
9. **Armstrong Steam QM®-1** measures steam quality; information transmitted via Modbus to PLC/HMI supplied by Armstrong. **(E)**
10. **Armstrong PRV** reduces steam pressure. **(F)**
11. Safety relief valve (ASME Code, as required).
12. Visual pressure gauge and pressure transducer installed downstream of PRV translates reduced steam pressure and transmits signal to PLC/HMI supplied by Armstrong. **(G)**
13. Drip leg collects and drains condensate trapped between PRV and automatic on/off full port ball valve installed downstream, condensate drained to low pressure condensate return; **thermostatic steam trap** removes subcooled condensate, air and noncondensable gases (NCG), drained to atmospheric discharge. **(H)**
14. On/off flanged full port ball valve with electro-pneumatic actuator is controlled by pellet mill or extrusion control system; mechanical switches available to confirm complete opening of valve to pellet mill or extrusion control system. This equipment is not standard but can be available as an option. **(I)**
15. Pellet mill or extrusion control system transmits signal to multilingual intelligent positioner located on a **control valve**, which feeds steam into conditioner chamber; digital positioner sends feedback signal to pellet mill or extrusion control system, confirming opening percentage of control valve; all steam is direct injection. The value is CLASS 6 and may be used as an on/off value as well. **(J)**
16. Visual pressure gauge and temperature transducer installed downstream of control valve monitors steam temperature feed to pellet mill or extruder and delivers information to operator.
17. Flexible connector, made of stainless steel corrugated hose and single stainless steel braid, absorbs vibration from conditioner chamber. **(K)**



STEAM QM®-1 AUTOMATIC STEAM QUALITY MONITORING

Quicker and consistently more reliable and accurate than manual methods, Armstrong's Steam QM®-1 automatically detects the dryness fraction of steam and provides continuous steam quality measurement data trending over time.

VERIS ACCELABAR® FLOW MEASUREMENT

No straight run of pipe ? No problem for Armstrong's patented flow meter. VERIS Accelabar® delivers reliable accuracy in utility metering and submetering without strict installation requirements. In a class of its own, this highly accurate flow measurement device has a patented no-straight-pipe installation requirement. VERIS Accelabar® provides exceptional versatility, with turndown capabilities over a large range of flow rates.

PROGRAMMABLE LOGIC CONTROLLER (PLC) WITH INTEGRATED HUMAN MACHINE INTERFACE (HMI)

The PLC performs All thermal and cost calculations. Operators and personnel monitor system information in real time using HMI.

PRESSURE REDUCING VALVES (PRVS)

Armstrong can help you manage your steam, air and liquid systems safely and efficiently with pressure reducing valves (PRVs) to maintain constant pressure for process control and uninterrupted productivity. We offer several types of PRVs to match your requirements.

CONTROL VALVES - FLY SERIES

Armstrong Delta2 - Fly Series is a single seat globe control valve with a robust construction designed for a wide range of process applications and easy maintenance.

- Size from DN15 to DN200 and from 1/2" to 8".
- DIN pressure rating from PN10 to PN100.
- ANSI pressure rating from 150 Lbs to 600 Lbs.

- Materials Full range of materials and special alloys are available for valve body and trim including hardening treatment. Special NACE design and material construction for sour service with a compliance declaration in accordance to NACE regulations.
- Guiding Valve guiding is top for standard parabolic plug. DN15 (1/2") to DN50 (2") is stem guided, DN65 (2-1/2") and bigger is shaft guided.
- Trim Standard construction includes parabolic plug and threaded replaceable seat.
- Packing Standard packing offers an internal self-adjusting spring system that provides low emissions according to the latest environmental regulations (TA-Luft and ISO-15848). In case of emission free request a bellow seal bonnet with different pressure ratings and materials are available.
- Severe Service Single and double stage low-noise cage trim is available for most valve/ trim sizes and designs. Single and double stage cavitation control trim is also available.

CONTACT YOUR ARMSTRONG REPRESENTATIVE

If you're interested in learning more about Armstrong Steam Harness and all the rugged, dependable equipment and leading-edge technology it includes, contact your Armstrong rep for details.

To get more information or to find your representative, visit **armstrong**international.eu

INTELLIGENT SOLUTIONS IN STEAM, AIR AND HOT WATER

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