



Technical Standard

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Mondi AG.
Mondi Standard Harmonization

DESIGN CRITERIA FOR INSTRUMENTATION AND AUTOMATION

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ABBREVIATIONS

AC	Alternating current
AI	Analog input
AO	Analog output
ATEX	ATmosphères EXplosibles, explosive atmospheres
brown field	rebuilt, existing process area
CD	Cross Direction
CV	Flow Coefficient
DC	Direct Current
DCS	Distributed Control System
DDL	Data Definition Language
DI	Digital input
DIN	Deutsches Institut für Normung, German Institute for Standardization
DN	Diameter Nominal
DO	Digital output
DTM	Device Type Manager
EDDL	Electronic Device Description
EMC	Electromagnetic Compatibility
EN	European Standard
etc.	et cetera, and other similar things
EU	European Union
exi	Intrinsic Safety; An explosion protection concept for ATEX areas
FAT	Factory Acceptance Test
FDT	Field Device Tool
HART	Highway Addressable Remote Transducer
HVAC	Heating Ventilation and Air Condition
HW	if feeding pump is not stopped with HW interlock
I/O	Input/Output
ICT	Information and Communications Technology
IEC	International Electrotechnical Commission
IP	Ingress Protection
ISO	International Organization for Standardization
MC	Medium Consistency

MCS	Machine Control System
MD	Machine Direction
NPT	National Pipe Thread
NS	Nominal Size
OPC UA	Open Platform Communications Unified Architecture
P&I diagram	Piping and Instrumentation diagram
PED	Pressure Equipment Directive
PFA	Perfluoroalkoxy
PLC	Programmable Logic Controller
PM	Paper Machine
PTFE	Polytetrafluoroethylene
QCS	Quality Control Systems
SIF	Safety Instrumented Functions
SIL	Safety Integrity Level
SIS	Safety Instrumented System
SRS	Safety Related System
UPS	Uninterruptible Power Supply
VAC	Volts Alternative Current
VDC	Volts Direct Current
VMS	Vibration Monitoring System
WBS	Web Break System
WIS	Web Inspection System

1 GENERAL

The purpose of this document is to present the criteria for instrumentation and automation engineering, equipment and systems in Mondi pulp mill and paper mill projects. The aim is to describe the leading principles and practises. Detailed technical solutions are not presented.

1.1 Codes and Regulations

The equipment and installation shall comply with the following standards, regulations and instructions:

- Local authorities' regulations and recommendations
- Laws and regulations currently in force in the current country, especially:
 - 250/2021 Sb. „Zákon o bezpečnosti práce v souvislosti s provozem vyhrazeným technických zařízení a o změně souvisejících zákonů“
 - NV 190/2022 Sb. „Nařízení vlády o vyhrazených technických elektrických zařízeních a požadavcích na zajištění jejich bezpečnosti“
 - NV 194/2022 Sb. „Nařízení vlády o požadavcích na odbornou způsobilost k výkonu činnosti na elektrických zařízeních a na odbornou způsobilost v elektrotechnice“
- EU norms and directives (Machine, PED, EMC, Low Voltage, ATEX, etc.)
- Project instructions
- Mill specific standards
- IEC recommendations
- Mondi standards:
 - MG0001 General Mill Specifications Summary
 - MEIA0001 Electrical, Automation and Instrumentation Instructions for Equipment and Machinery Suppliers
 - MEIA0002 Recommended Manufacturers for Electrical and Instrument Equipment
 - MEIA0003 Design Criteria For Instrumentation and Automation
 - MEIA0004 Electrical Design Criteria
 - MEIA0005 Cable standard
 - MEIA0006 Implementation Procedure for Safety Related Systems (SRS)
 - MEIA0007 Instrument and Automation Installation Standard
 - MEIA0008 Electrical Installation Standard
 - MEIA0009 Implementation Procedure for Control Systems (DCS, MCS) and FAT
 - MEIA0010 Implementation Procedure for Quality Systems (QCS, Web Break System, Web Inspection System, Vibration Monitoring System)

- MEIA0011 Control Systems Process Interfacing Standard
- MEIA0012 DCS and MCS programming standard
- MEIA0013 Earthing and Lightning Protection Standard
- MEIA0014 Lighting Design Criteria
- MEIA0015 Operational Technology Information and Communication Technology (ICT) standard
- MEIA0016 Implementation Procedure for electrification, automation and instrumentation checkouts and cold commissioning
- MH0001 HVAC Design Criteria
- MM0002 Piping Standard (Process connections for instrumentation)

1.1.1 Functional Safety

International Generic Functional Safety Standard EN / IEC 61508 (Functional safety of electrical/-electronic/programmable electronic safety related systems), the Technical Application Standard EN / IEC 61511 (Safety Instrumented Systems for the process industry sector) and ISO 13849 (Safety of machinery - Safety-related parts of control systems) require complying with the safety life cycle model described in these standards in everything, which deals with operational safety.

The standard requires leading the requirements from the analyzed risks, to carry out the design fulfilling all the requirements, verifying and qualifying the various design stages.

1.1.2 ATEX Classification

ATEX (Atmosphere Explosible) classification for each Ex-area shall be made according to standards IEC 60079-10-1 (Explosive atmospheres - Part 10-1: Classification of areas - Explosive gas atmospheres) and IEC 60079-10-2 (Explosive atmospheres - Part 10-2: Classification of areas - Explosive dust atmospheres).

ATEX Zone classifications to zones 0, 1 and 2 for the explosive gases and liquids and zones 20, 21 and 22 for the inflammable dusts and powders are specified in the clarification. Ex-areas are presented in layout drawings with necessary sectional views in such a way that exact limits of the Ex-areas are clearly indicated there.

The electrical and mechanical equipment for the Ex-areas shall be specified according to standards IEC 60079-0 (Explosive atmospheres - Part 0: Equipment - General requirements), IEC 60079-14 (Explosive atmospheres - Part 14: Electrical installations design, selection and erection) and ISO 80079-36 (Explosive atmospheres - Part 36: Non-electrical equipment for explosive atmospheres).

2 AUTOMATION

This description gives guidelines for the applications and technology for process automation and continuous control. In general all control should be implemented in DCS in agreement with supplier. All "Black boxes" must be avoided. All information

regarding safety and control and alarm should be fully visualised in operator environment.

2.1 I/O' and System Rooms

There are two options to located instrumentation process interfaces (I/O's). The option which will be used shall be decide and approved by Purchaser in each project.

- 1) Instrumentation will be interfaced with traditional process interfaces (I/O's). I/O's and process controllers will be centralised in the system rooms and mounted to separate I/O cabinets.
- 2) The instrumentation process interfaces (I/O's) will be distributed to field junction boxes. The process controllers will be centralised to the system rooms.

The control, electrical and system rooms shall be equipped with an air conditioning system with humidity controls and chemical filtering. Heating ventilation and air condition (HVAC) designing of the rooms shall be according to the HVAC Design Criteria standard MH0001.

2.2 Distributed Control System (DCS)

The Distributed Control System (DCS) will take care of all the elementary process control functions of the plant. Separate PLCs are used only where they are an integral part of the machinery, and the implementation should be done in agreement with the Purchaser. Blind pneumatic or hydraulic controls shall not be used.

2.3 Machine Control System (MCS)

Some machinery will have controls of their own delivered with the machine packages. The Machine Control System will take care of all the elementary controls of this machinery, and the implementation should be done in agreement with the purchaser.

The systems shall be communicating with each other and other mill systems with device buses (Profinet) or OPC UA interface. OPC will not be used for interlocking and control signals. In all cases the visualisation of the controls shall be realised in the DCS operator interface.

2.4 User Interface

Process operators use mainly the DCS operator stations for process monitoring and control. The DCS operator interface shall support viewing of data of other systems, too. Control places, local panels and mobile operator interface shall be arranged where required for operation of machinery and various processes.

2.5 SRS (Safety Related Systems)

The Safety Related Systems will take care of all safety related functions of the process. The general implementation procedure of the Safety Related Systems is specified on standard MEIA0006 (Implementation Procedure for Safety Related System (SRS)). This standard is premised on the IEC standard 61508 (Functional safety of

electrical/electronic/programmable electronic safety-related systems) and the IEC 61511 (Functional safety: Safety instrumented systems for the process industry sector).

The Safety Instrumented System (SIS) consists of hardware and software controls which are used to implement one or more Safety Instrumented Functions (SIFs). SIS has to be independent from DCS.

2.6 Quality Systems

The machine will be equipped with:

- Quality Control Systems (QCS) with traversing measurements of basis weight and moisture. Additional sensors are added in agreement with the purchaser. Machine controls (MD and CD) for basis weight and moisture are included.
- Web Break System (WBS) monitoring and indicate web breaks on the paper machine. WBS system can help operators to investigate and reduce web breaks. WBS is included as a standard on the paper machine in green field projects.
- Web Inspection System (WIS) and Web Monitoring System (WMS). These systems detecting holes and defects on paper. An integrated WIS/WMS system could be an alternative.
- Vibration Monitoring System (VMS).

2.7 Functional Design

The loop wise functional descriptions shall be used to make the functional design for the Distribution Control System (DCS, MCS, SRS, etc.).

Loop wise functional descriptions shall be applied to the entire instrument and electrical loops, sequences and group start functions that are controlled from DCS or other control systems.

The functional descriptions will provide sufficient clear information to be of practical use to all user groups requiring it. (Design, Maintenance, Operations).

The functional descriptions are loop wise and are stored in html format.

Source material shall be gathered from process descriptions, P&I diagrams, and function/interlocking diagrams.

Functional descriptions are also part of the operation instructions. Operators can access the functional descriptions from the DCS operating display.

2.8 Junction Boxes

Material of junction boxes shall be EN 1.4401. In dry and protected areas fibre glass can be used but also other material can be used if approved by the purchaser.

Painted carbon steel boxes can be used in dry and protected areas if approved by the purchaser.

In the green field projects (new process areas) the junction boxes will house necessary converters and power supplies for the Profibus PA, Profibus DP ,Profinet and Remote I/O.

The cabling from junction boxes to DCS will be implemented with multipair signal cables via cross connecting or with fibre optic cables.

Air supply manifolds for solenoid valve block and instrument air distributions for control valves are located in the boxes. Instrument air filters (5 micron or larger, if acceptable for the installed equipment), shall be outside of the boxes.

Instrument air connection for a junction box on the air header is 1/2" and piping to the box shall be 15 x 1.5 mm (EN 1.4401).

The box will be air purged and over-pressurized with instrument air.

Adequate cooling or heating system depending of ambience shall be arranged.

Field junction boxes shall be loaded average of 80 %, allowing 20 % spare capacity for future condition.

2.9 Voltage Distribution for Field Equipment

Voltage distribution with fuses will be used for the 230 VAC UPS (/24VDC) power supply for field instruments. Individual cables will be connected from each instrument to the power distribution terminals located in junction boxes.

3 INDUSTRIAL CAMERAS AND RECORDING SYSTEMS

Surveillance cameras with monitors in the control rooms shall be used where the remote controls of machinery or safety matters so require.

The technology and system setup should be decided in agreement with the purchaser.

4 FIELD INSTRUMENTS AND VALVES

4.1 General

HART protocol is mandatory. Other solution must be approved by the purchaser.

Equipment like valves, flow meters etc. in areas like Recovery Boiler, Evaporation... must be approved from the purchaser.

All transmitters, positioners and sensors shall have certificates of validation.

4.2 Control Signals and Voltages

4.2.1 Signal ranges

In green field:

Analog signal	4 to 20 mA, supply 24 VDC, with Hart
Binary	24 VDC
Fieldbus	Profibus PA, Profibus DP, Profinet

In brown field:

Analog signal	4 to 20 mA, supply 24 VDC, with Hart 0 to 20 mA DC 0 to 10 VDC 0 to 20 VDC
Binary	24 VDC
Fieldbus	Profibus PA, Profibus DP, Profinet

In the brown field the existing communication protocol will be used. The communication protocol to be decide by Purchaser in each project.

4.2.2 Auxiliary supplies

Alternating current (AC)	230 VAC 50Hz
DCS / PLC	230 VAC (UPS network)
Direct current (DC)	24 VDC
Pneumatic	550 to 600 kPa

4.2.3 Termination of signals

There are three options to connect signals to control system. The option which will be used shall be decide and approved by Purchaser in each project.

- 1) traditional hardwired signals from field to system I/O modules in system room
- 2) distributed I/O in the field boxes
- 3) fieldbus for instrumentation and device bus for motor controls.

4.2.3.1 Traditional Hardware Signals

Analog signals (non fieldbus analog devices) (mA) will be cabled with single or multipair cables and terminated to terminal blocks in junction boxes or in special cases straight to cross-connection cabinets in system rooms.

Binary signals (discrete) shall be cabled either with single or multipair cables and terminated to terminal blocks in junction boxes or in special cases straight to cross-connection cabinets in system rooms.

Cross-connection will be done between terminal blocks of field cables and I/O terminals.

4.2.3.2 Distributed I/O

The I/O units will be located in field junction boxes. The remote I/O units (AI/AO and DI/DO) will use Ethernet, Profinet or DCS supplier bus to communicate with the DCS.

4.2.3.3 Fieldbus

In the green field projects (new process areas) the field bus to be applied is Profinet, and its extension Profibus PA for process automation. In the brown field projects (rebuilt) the existing communication protocol will be used. The communication protocol to be decided by Purchaser in each project.

In the green field projects Profibus PA will be used for analog signals. Field instruments for Profibus PA connection will be cabled via PA distribution units to Profinet/Profibus gateway modules located in field junction boxes.

The digital signals will be cabled to Remote I/O with the exception of on-off valves which will use Profinet connected solenoid valve blocks located in field mounted junction boxes. The solenoid valve blocks will interface the limit switches for the on-off valves.

Profinet will be used for motor controls and can be used also for motor operated valves.

Profinet is used for variable speed drive signals.

4.3 Material of Field Equipment

Wetted parts of sensors, transmitters, control- and on off valves shall be stainless steel EN 1.4401 but if process media requires other material can be used. Assembly bolts and nuts as well as mounting devices shall be of stainless steel EN 1.4401.

4.4 Transmitters and Analysers

The transmitters shall communicate with the 4...20 mA analogue signals, with superimposed HART communication and support electronic device descriptions like FDT/DTM (Field Device Tool/Device Type Manager) or EDDL (Electronic Device Description) or DDL (Data Definition Language) for asset management purposes.

Various intelligent analysers providing several process and calculated variables shall preferably be connected with industrial Ethernet or Profinet to the process control system of the area.

4.5 Local Flow Indicators and Switches

Flow indicators and/or switches for sealing water system shall be included in the machine delivery (pumps, agitators etc.). If alarm or interlocking is needed, the signals shall be connected to the DCS system. The switches shall be of proximity and 2-wire type.

4.6 Temperature Gauges

Bimetallic thermometers shall be used for local temperature indication.

Welded/threaded thermowells will be used acc. to chapter 4.15 Temperature Measurements.

4.7 Pressure Gauges

Pressure gauges shall be of EN 1.4401 and damped with silicon oil. R1/2" connection to be used. Siphons shall be used in steam applications. The scale shall be according to DIN standard.

Gauges used for measurement in accordance with legal requirements shall be certified.

4.8 Pressure and Temperature Switches

Pressure and temperature transmitters shall replace switches if possible.

4.9 Limit Switches, General

Two-wire proximity detectors 24 VDC shall be used as limit switches. Three-wire proximity detectors can be used in special cases for example in MCS.

If mechanical switches are used, the contacts shall be gold plated.

Following applies for the proximity detectors:

- Diameters 8, 12, 18 or 30 mm
- protection class IP68
- instead of connector tail cable will be used
- Material is EN 1.4401. In dry and protected areas also plastic can be used

4.10 Flow Measurement

4.10.1 Magnetic Flowmeters

Magnetic flow meters shall be used whenever possible.

The transmitters shall be of remote mounted type and equipped with local indication.

All materials (flanges, liners, sealings, electrodes etc.) according to DIN standards and manufacture's specifications.

The flanges of the flow tube shall be according to DIN standard.

Manufacturer's instructions shall be followed in the dimensioning and selection of the flow tube. Special care has to be taken with fluid conductivity, temperature and consistency.

Strong conductivity fluctuations in the fluid affect the selection (chemical mixing applications) of the flow tube/transmitter.

Possibility of vacuum shall be checked.

Straight pipe runs before and after magnetic flow tube shall follow the manufacturer's instruction. Minimum of 5xD before and 2xD after can be used as basic rule.

The size of the primary head should be, if possible, selected to provide a velocity of 1,5 to 5,5 m/s for full-scale range.

The tubes shall be provided with a protection ring in the inlet of the flow tube for PTFE and/or PFA liner protection.

When the process piping material is reinforced plastic, a grounding ring on both sides of the flow tube shall be installed.

Electrode material is HAST C as standard. Other electrode materials will be used e.g. in chemical applications according to the flow tube manufacturer.

4.10.2 Mass Flowmeters

Mass flow meters shall be used for chemicals, gases etc. when accuracy of the measurement is important or the fluid does not allow the use of magnetic flow meter.

4.10.3 Ultrasonic Flowmeters

Ultrasonic flow meters can be used for effluent and clean waters for pipe size >DN300 (project specific).

In special cases the use of ultrasonic flow meters is accepted (oil flow measurements in PM press section).

4.10.4 Steam, condensate and gas flow measurement

Vortex Flowmeters

Vortex flow meters can be used for condensate and steam where applicable. Straight runs before and after the flow meter shall be according to the suppliers' instructions.

Orifice Plates

The type of orifice plate shall be "corner taps" (DIN19205B).

Orifice plates shall be used for measurement of steam, condensate and air for pipelines >DN80.

The pressure tapping and condensate pots and isolation valves shall be threaded (pressure class < PN40). Condensate pots shall be used for steam applications.

Three-way manifolds shall be used with the DP-cell.

Initial differential pressure for sizing the orifice plates is 25 kPa. If applicable, 15 or 30 kPa can be used. The target of the pressure loss in the orifice plate is 1 kPa.

Signal linearization will be done in transmitters and possible temperature/pressure compensation will be done in the DCS.

As straight pipe runs before/after the orifice plate >20D/ >5D shall be reserved. Actual lengths of the straight pipe lines according to the manufacturer's dimensioning.

4.10.5 Open Channel Measurements

Parshall flumes with ultrasonic level measurement can be used where effluent is flowing in floor channels.

4.11 Level Measurement

Flanged DN80 PN40 differential pressure transmitters shall be used as level measurement in atmospheric tanks. Thick measuring membrane (150µm) shall be used for e.g. pulper applications. Ceramic membranes can be used.

Centre of process connection of the DN80 level transmitter shall be placed at the upper level of the highest pump suction connection.

Flanged level transmitters in towers, high volume tanks and chemical tanks shall be equipped with isolation valve for transmitter removal as well the applications where the transmitter must be safely removed for maintenance or replacement.

The level in condensate and other non-atmospheric tanks shall be measured with differential pressure transmitter.

Microwave or radar type transmitters can be used for chemical tanks and bulk materials, installed on the top of the tank.

Weighing devices can be used chemicals and non-fluidic materials.

Radiometric level meter can be used for tanks and droplegs of MC-pumps.

4.12 Consistency Measurement

Blade type consistency transmitters shall be used as standard. Remote mounted converter shall be equipped with a local indicator.

Rotating type, optical or microwave consistency transmitters shall be used where higher accuracy is needed.

In low consistency (< 1,5%) applications, optical consistency transmitters can be used.
The selection shall be approved by the manufacturer.

4.13 Pressure Measurement

The process connection shall be according to the service:

- Flange (flush mounted transmitter or transmitter with capillary and seal)
- Threaded connection (impulse line). Isolation valve shall be used depending on application.

Threaded connection (impulse line) type transmitters shall always be installed with 2-, 3-, 5-way valve blocks (manifolds).

Process connections of valve blocks and transmitters shall be ½" NPT.

Condensate pots shall be used for steam applications.

For stock, white water and filtrate pressure measurements and in non-vibrating conditions, flush mounted transmitters shall be used. The use of isolation valves shall be defined case by case. Pressure measurements in cleaner plants and rotating screens shall be without isolation valves. In vibrating and plugging conditions flanged capillary (DN 80, DN 50) can be used.

Clean water and pressurized air transmitters with threaded connection and impulse lines shall be used.

Miniature pressure transmitters or pneumatic 1:1 repeaters can be used instead of flanged capillary.

4.14 Conductivity and PH Measurement

Inline sensors (retractable) shall be used.

4.15 Temperature Measurement

Resistance bulb Pt100 (DIN 43762), 4-wire, vibration resistant and spring loaded temperature elements shall be used for all temperature measurements up to 400 °C.

When temperature is higher than 400 °C, a thermocouple type K (Chromel - Alumel) according to DIN IEC 584.

Temperature converters shall be installed in the connection heads. In case of high environmental temperature or high vibration remote mounted converters shall be used.

The thermocouple transmitters will be located in the field in protection boxes or junction boxes. Mounting is type DIN rail NS 35.

Following types of the thermo wells shall be used:

- DIN 43772 form 2G threaded thermo well
- DIN 43772 form 4 welded thermo well

- DIN 43772 form 2F flanged thermo well

Connection head shall be selected according to the standard DIN 43729.

Welded thermo wells will be used for pressurized air (mill and instrument air), gas, steam, condensate, chemical, white water and high consistency pulp applications.

Threaded thermo wells will be used for water, pulp and low pressure air.

In tanks depending on tank material threaded or flanged process connection shall be used. Threaded in metal and flanged in plastic tanks.

Pyrometer will be used for surface temperature measurement in high temperature applications. (Temperature up to +2500°C)

4.16 Weight Transmitter

Strain gauge type weighing systems shall be used. Sensing elements shall be fixed to the steel construction.

4.17 Remote Operated Control and On-Off Valves

4.17.1 General

In the green field projects the remote operated control and on-off valves shall be equipped with pneumatic actuators and valve controllers communicating with ProfibusPA, 4...20 mA analogue (HART) signal or controlled with solenoid valves installed in field boxes. In the brown field projects the existing communication protocol will be used. The communication protocol to be decide by Purchaser in each project.

Limit switches indicating the end positions for on-off valves shall be used.

Safety critical places valve actuator will be equipped with the mechanical safety locking device to ensure safe maintenance work.

4.17.2 Valve types

- a) Mainly segment ball, ball and butterfly valves with metal seats shall be used. Globe valves shall be used in steam and condensate, if necessary.
- b) Ball valves with reduced bore may be used up to DN 250 - DN 300
- c) The smallest acceptable size for butterfly valves shall be DN 80
- d) Instead of three-way or four-way valves, two or three standard valves shall be used. This is a subject of Mondi approval. The use of four-way valves is foreseen only in special applications as a part of machine for example refiner inlet/outlet/by-pass valve.

e) All control and on-off valves shall be:

- Full ball flanged all sizes (small size with weld ends, DN15-50)
- Segment ball wafer for size ≤ 250 mm, flanged for size > 250 mm
- Butterfly wafer for size ≥ 80 mm
- Globe flanged
- Knife valve wafer

4.17.3 Control Valves

Tubing between the positioner and the actuator shall be of stainless steel EN 1.4401.

The size of the pneumatic supply cable will be defined according to actuator size.

Maximum noise level allowed for a control valve is 85 dB.

5 bar instrument air supply shall be used for sizing of actuators. Critical cases shall be sized with 4 bar.

Actuators shall normally be double acting equipped with valve position indication. Spring-to-close or spring-to-open actuators shall be used in special applications and shall be decided case by case.

Metal seats shall be used as standard for all types of valves.

Smallest flanged connection size will be DN25.

The valves shall be sized with the manufacturer's sizing program. The valve supplier is responsible for the final valve selection and sizing.

4.17.4 Guide for Control Valve Selection

Butterfly valves shall be used generally for water and pulp when consistency is under 2.5 % and also for low pressure steam, <4 bar. Minimum size is DN80. Butterfly valve shall not be used for consistency control applications.

Segment ball valves shall be used as general control valves when consistency of pulp is above 2.5 %.

Ball valves shall be used when pulp has mechanically aggressive impurities.

Globe valves shall be used in low CV applications (for example chemical controls).

4.17.5 Remote Controlled On-Off Valves

The valve size equals to pipe line size or in case of pump start up valve to pump flange size.

5 bar instrument air supply shall be used for sizing of actuators. Critical cases shall be sized with 4 bar.

On-off valves shall be equipped with open and close limit switches. The switches shall be two wire type proximity switches. Three wire proximity switches to be agreed with the purchased (with old DCS input cards).

When the valve opening/closing speed needs to be adjusted with big on-off valves (e.g. screen inject/accept valves), the valve shall be equipped with a positioner so that ramping can be controlled from DCS.

4.17.6 Guide for On-Off Valve Selection

Segment ball valves shall be used as standard for small dimension on-off valve applications. Valve tightness in both directions shall be checked. With water small ball valves with weld ends can be used.

Butterfly valves shall be used as a standard for on-off applications >DN80 up to 4 % pulp consistency.

Ball valves shall be used when butterfly valves are not acceptable.

Knife gate valves with pneumatic actuators shall be used when large on-off valve is needed.

4.17.7 Guide for Actuator Type Selection

Actuators shall normally be double acting equipped with valve position indication.

Spring loaded actuators are standard solution for force valve to a safe position in safe functions.

Spring-to-close or spring-to-open actuators shall be used in following applications:

- a) Spring-to-close actuator shall be used for first control or on/off valve after main steam header.
- b) Spring-to-close actuator shall be used for high pressure (e.g. >2.5 MPa) shower water control and on/off valves according to machine supplier recommendations.
- c) Spring-to-close actuator shall be used for emergency stop related control and on/off valves (if feeding pump is not stopped with HW interlock)
- d) Spring-to-close actuator shall be used for start-up valves after big/high towers and applications where serious backflow may occur

All special applications shall be designed and decided case by case.

4.18 Sampling Valves and Sampling Systems

Special sampling valves shall be installed with all consistency transmitters. Preference is to use pneumatically operated sampling valves with proper flushing arrangement. Manual operated valves can be used if they can be located properly.

4.19 Manual Valves

If manual valve position indication (open-close) is needed for interlocking or other reasons, the limit switches shall be purchased with the manual valves (ready installed). The switches shall be of proximity type 24 VDC and 2-wire type. Three wire proximity switches to be agreed with the purchaser (with old DCS input cards).

5 SIGNAL CABLES

Cables shall be selected according to the cable standard MEIA0005.

Profibus PA devices will be cabled with Profibus PA cable. If Profibus DP devices are approved (in case of brown field project), they will be cabled with Profibus DP cable.

Shielded twisted pair cables shall be used for non-Profibus signal connections from transmitters and valves to the remote I/O units or terminal block mounted in junction box.

If traditional hardware signals and centralised I/O's are used, multipair cables shall be used from junction boxes to the centralised I/O units mounted in system rooms.

If distributed I/O's are used, Ethernet, Profinet or DCS supplier bus shall be used from junction box to DCS mounted in system room.

Silicone cables shall be used in high temperature environment.

Cables for exi devices shall be blue.

Cables for SIL devices shall be orange.

Combination cables (example $2 \times 6/4 + 2 \times (2+0.5) \times 0.5$) shall be used for on-off valves.

Combination cables (example $1 \times 6/4 + 2 \times (2+0.5) \times 0.5$) shall be used for control valves.

6 IDENTIFICATION

Every field equipment, box, cabinet, cable, room etc. have unique identification code, which are used in documents and labels in the final installation. The mill numbering standard shall be followed.

7 REQUIREMENTS TO AVOID CORROSION

The air in the automation and electrical rooms shall be mechanically and chemically cleaned to avoid corrosion in the field bus equipment electronics.

The electronics inside field boxes are more in danger to get exposed to corrosive atmosphere. The field boxes shall be over-pressurized with air taken from mechanically and chemically cleaned source. Instrument air is the preferred choice. Each field box shall be equipped with a double filter unit and a pressure differential switch indication.

If chemically cleaned air is not available then the components shall have a certification that they are applicable in Class G3 (paper mills) or Class GX (pulp mills) corrosive environment (equipped with a special lacquering).

Heating ventilation and air condition designing shall be according to the HVAC Design Criteria standard MH0001.