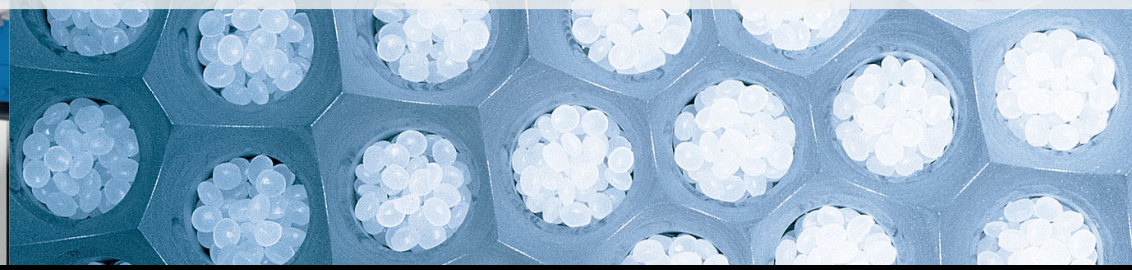
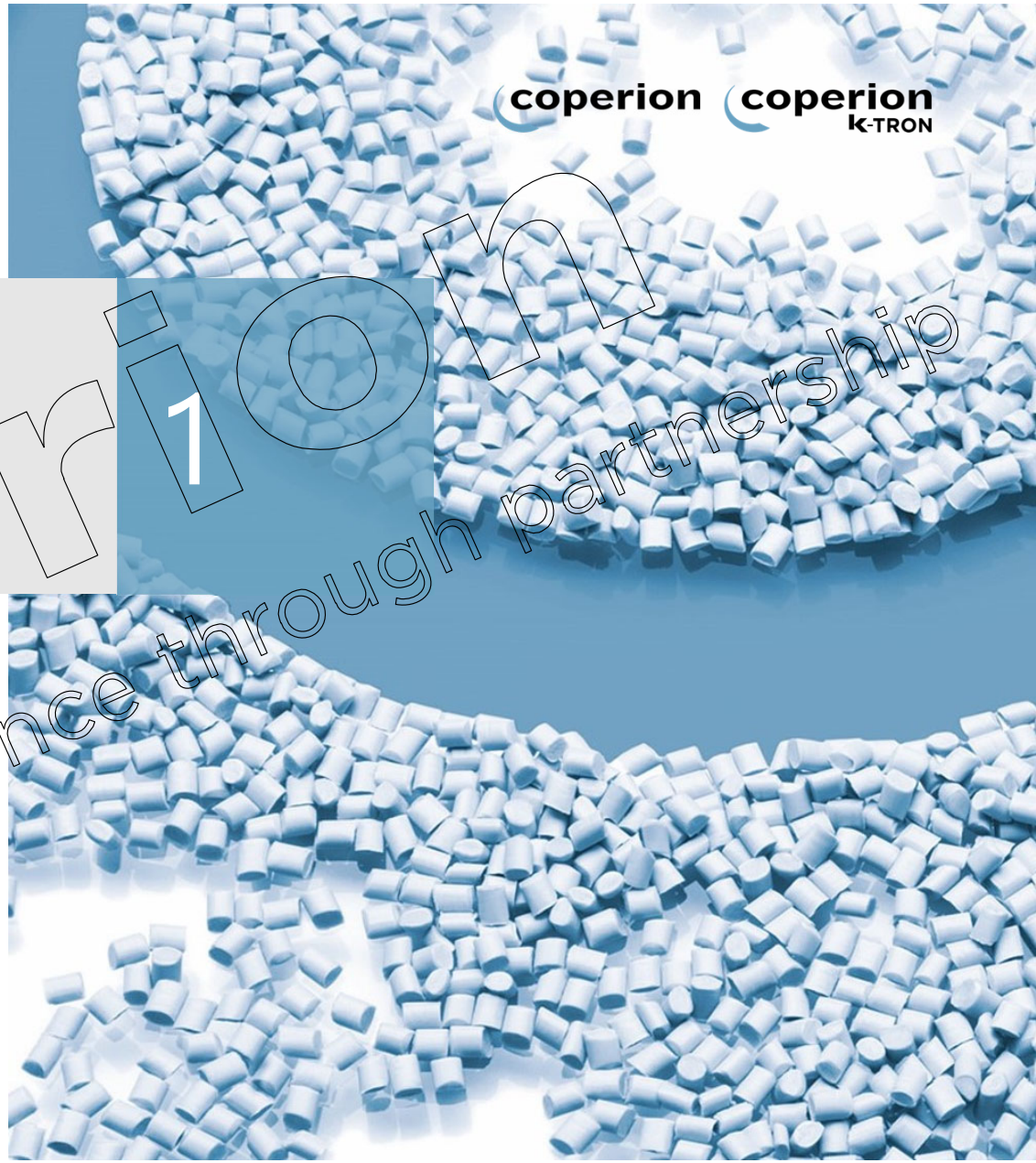
Additive Metering Package Process Trends

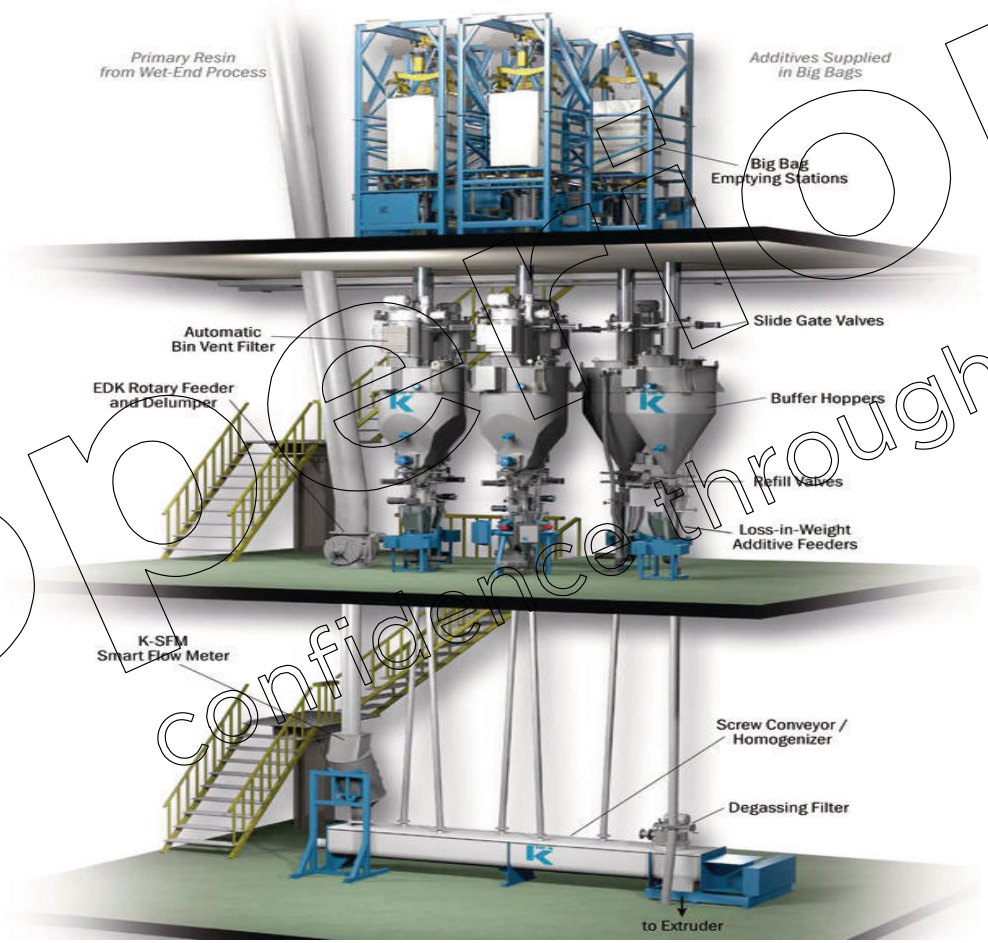
Chang Kyung, Kim – Sales Director, InFeed Corporation



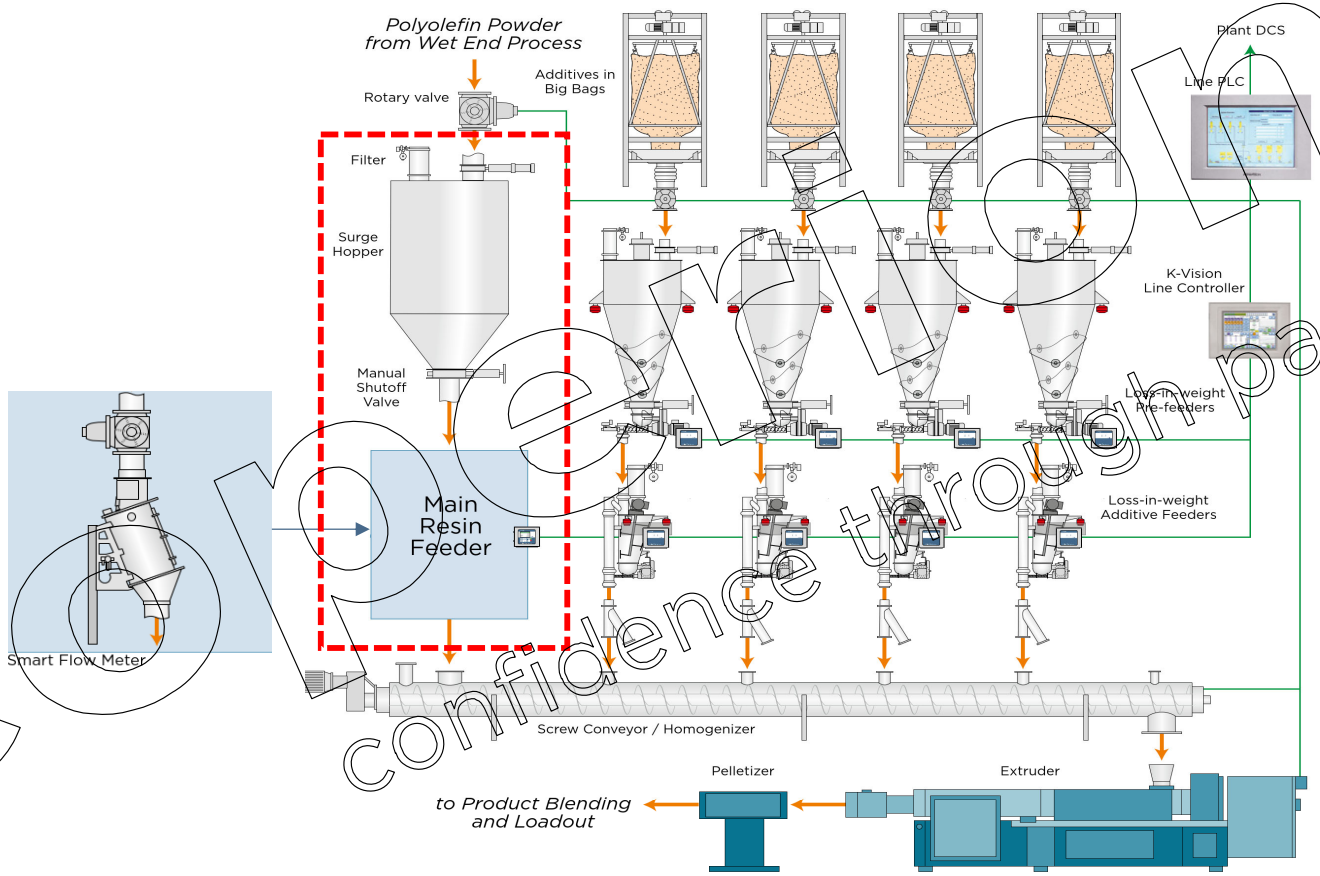
Typical Feeder Arrangement



Additive Unloading & Feeding System



Additive Unloading & Feeding System



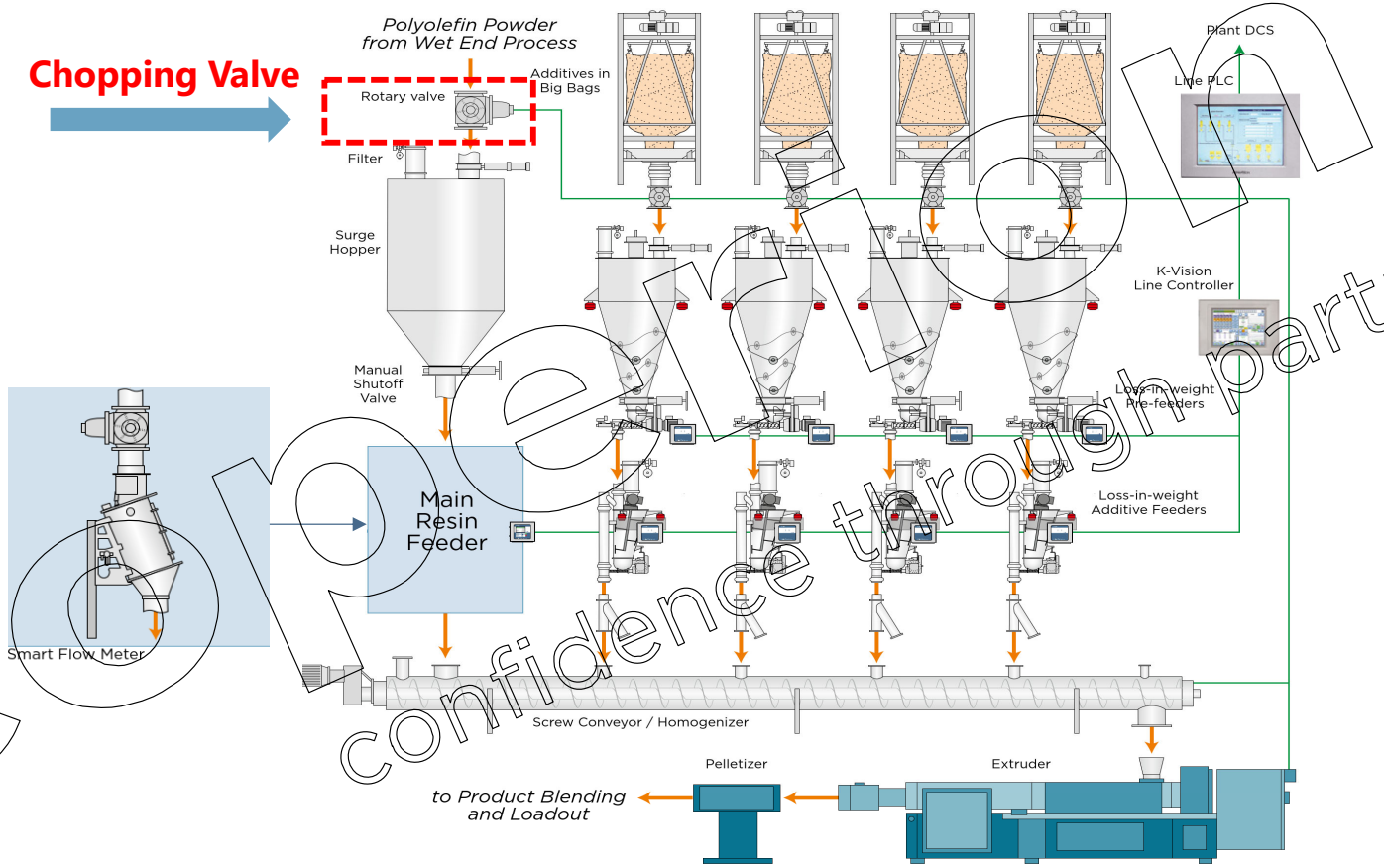
Polyolefin Production Plant - Dry End Process
Choices for the main resin feeder include a large LIW feeder, a large weigh belt feeder or a Smart Flow Meter.

Main Resin Feed Components

Coperion Technology Update 2025

Chopping Valve

Rotary Feeder



Polyolefin Production Plant - Dry End Process

Choices for the main resin feeder include a large LIW feeder, a large weigh belt feeder or a Smart Flow Meter.

Chopping Valve

Rotary Feeder

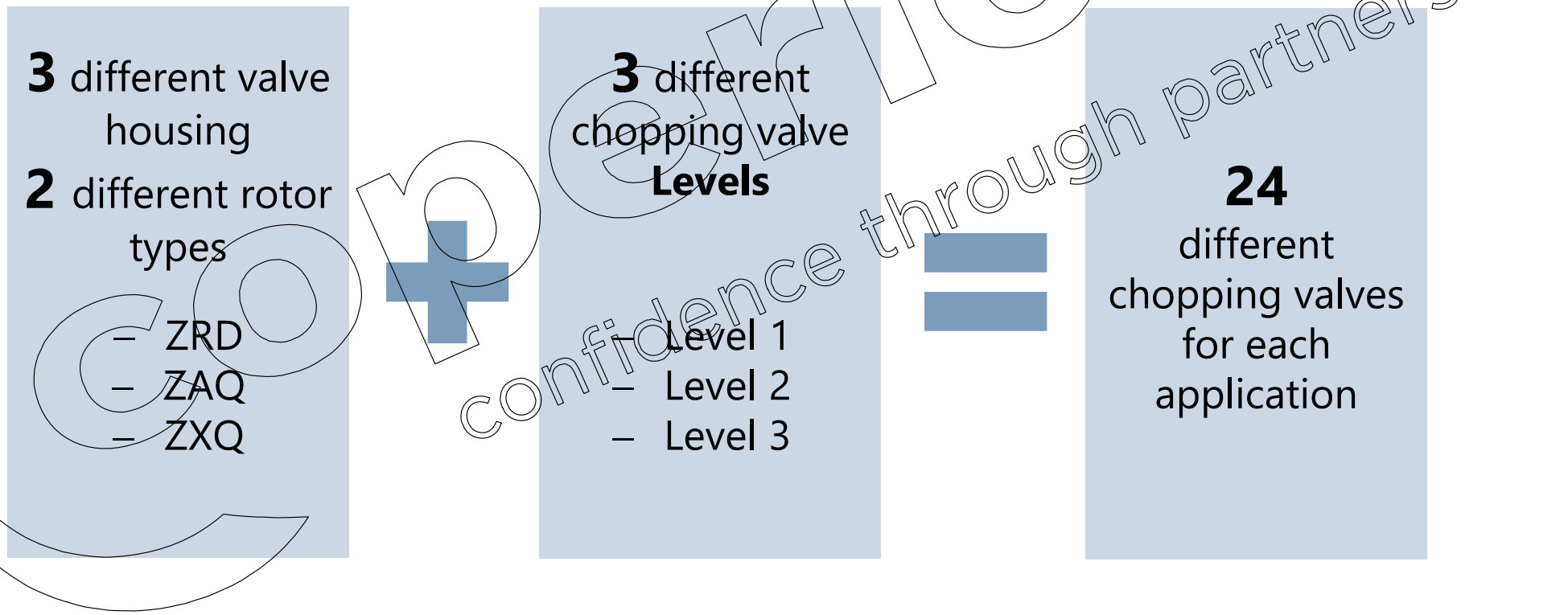
Adaptions for

- Agglomerated polymer in different forms
- Large and irregular lumps or sheets
- Particles which will not flow freely through standard rotary valves

Chopping Valve

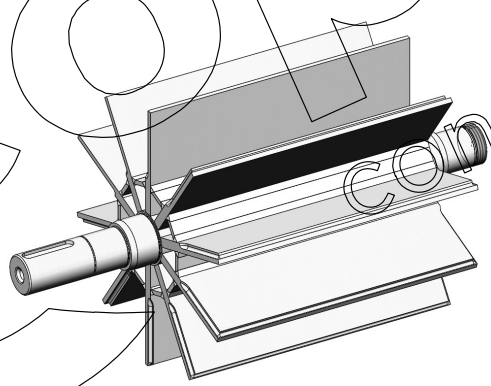
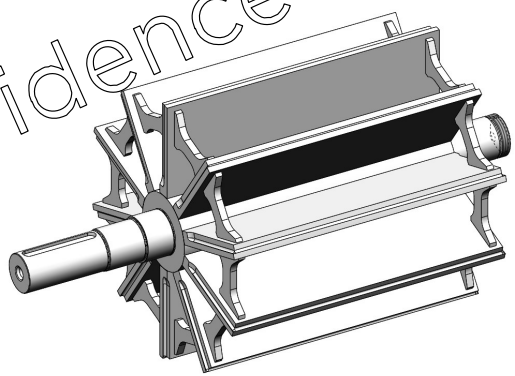
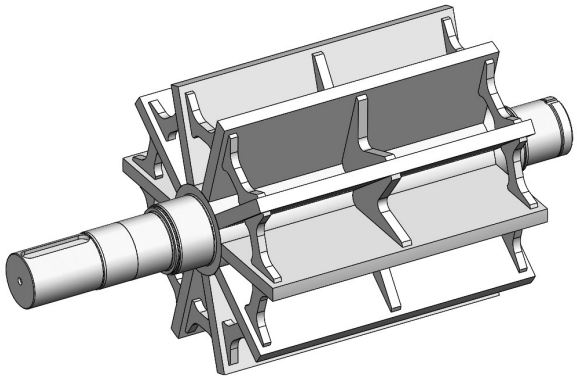
Rotary Feeder

- The secret recipe of the coperion chopping valve concept



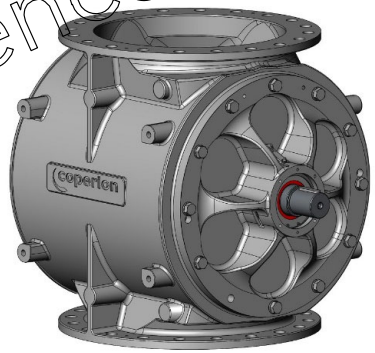
Chopping Valve

Specification/ Level Classification

	Level 1	Level 2	Level 3
Definition	min torque: 5,5 x D in mm [Nm] max torque: 5,5 x D in mm x 1,3 [Nm]	min torque: 10 x D in mm [Nm] max torque: 10 x D in mm x1,3 [Nm]	min torque: 10000 [Nm] max torque: 14000 [Nm]
Torque and cutting force			
Rotor			

Chopping Valve

Housing Types

Definition	Drop through		Blow through
	ZRD max. 1,5 bar	ZAQ max. 3,5 bar	ZXQ max. 3,5 bar
Level 1	320, 400, 480, 550, 630, 700, 800	500, 600	400, 500, 600, 700
Level 2	550, 630, 700, 800	500, 600	-
Level 3	550, 630, 700, 800	500, 600	-
Housing			

Chopping Valve

Specification

	Level 1	Level 2	Level 3
Housing	AC / SS (1.4308 or 1.4404)	SS (1.4308 or 1.4404)	
Side cover			
Rotor	SS 1.4541 (Standard) / 1.4462 (Duplex) depending on size		
Rotor blade design	Straight design		
Knifes	AC housing static knife at the housing inlet at down turning side	Welded static knifes on both sides at the housing inlet	
	SS housing Option: with knife		
Purge gas	With nitrogen and / or process gas		
Chamfering	Optional		
Heating	Optional		

Chopping Valve

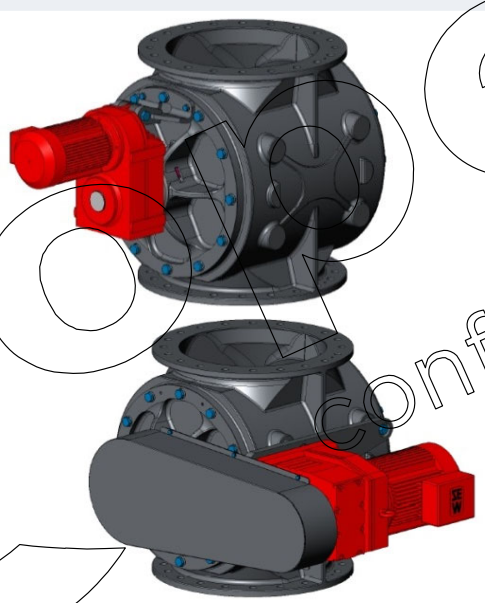
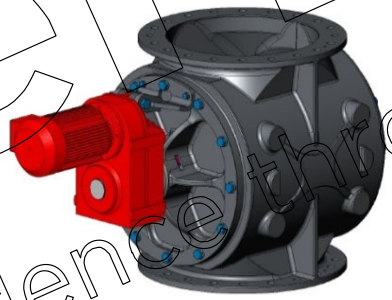
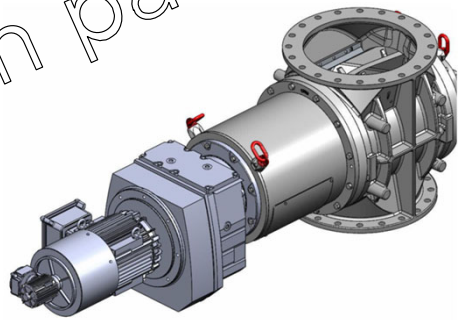
Advantages of the Coperion chopping valve concept for the process

With coperion confidence through partnership chopping valves …

- The high torque feature of the rotary valve provides additional security for system availability
  - This valve is a bottleneck in the process
- The rotary valve is gas lock device between purge / degasser bin and downstream equipment
  - Purge bin is operating in process gas atmosphere which should not leak into or should not be diluted from downstream nitrogen loop
  - Optional lump screen (downstream) can be operated at reduced operating pressure
- In many processes lump screens have been deleted, please keep in mind all lumps still remain within the product stream.

Chopping Valve

Drive Design

	Level 1	Level 2	Level 3
Drive	direct or chain drive	only direct drive	only direct drive with coupling and lantern piece
Operating mode	only with frequency converter		frequency converter not mandatory
Execution			

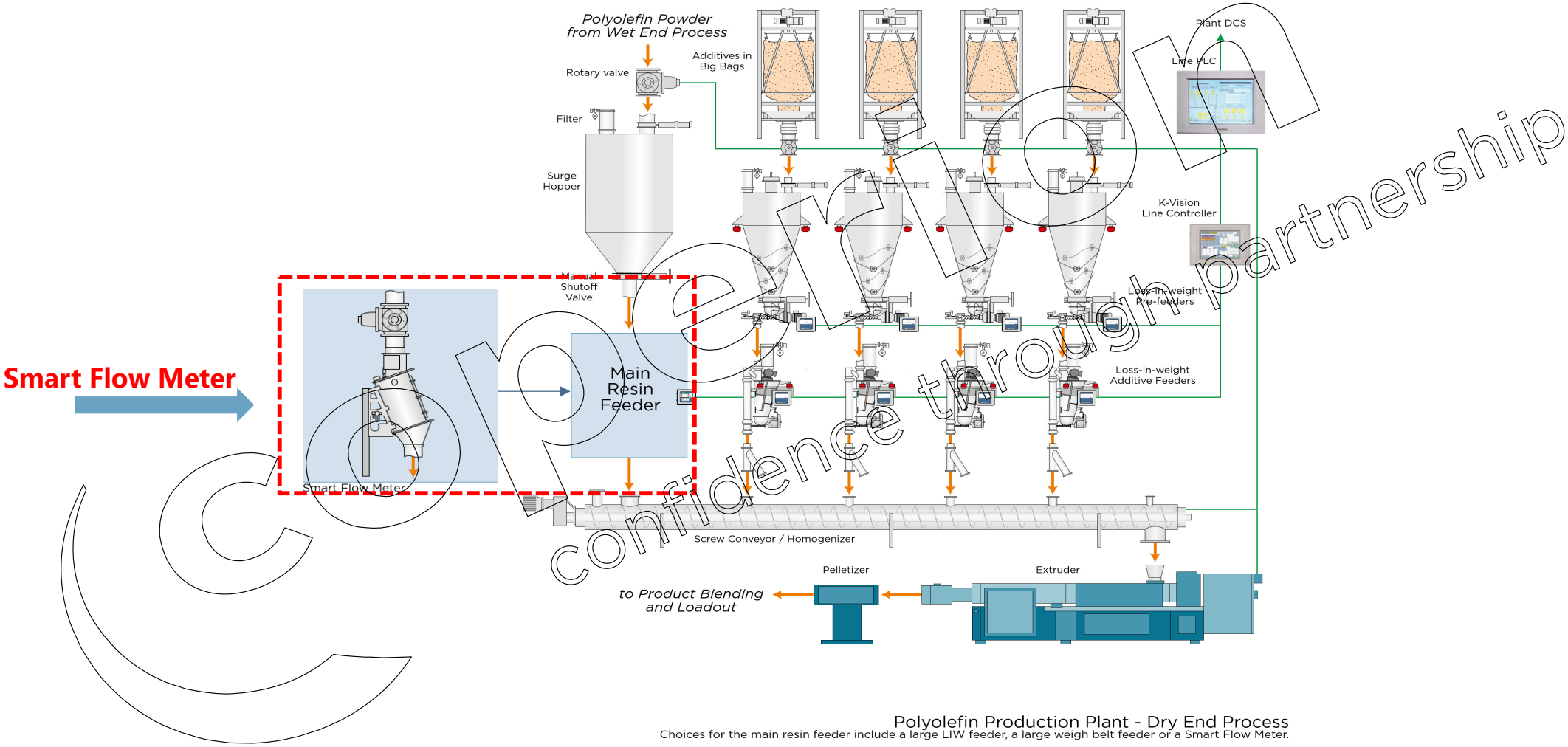
Chopping Valve

- Based on years of experience, Coperion is able to build adapted chopping valves suitable for respective polyolefin processes. Chopping valves are an upgrade of well – proven existing rotary valve types
- The step-by-step concept with three different torque levels offers maximum flexibility to the customer
- Coperion chopping valves use electrical drives → small footprint and easy maintenance / integration
- Maximized performance through optimized geometry

Chopping Valve

- The valves are equipped with standard bearings and gas piping, comparable with standard rotary valves from Coperion so there is no bottleneck in the procurement of spare parts
- Despite high complexity and design requirements, short delivery times can be achieved through the standardized design
- The high torque rotors are standardized, but adaptations can be made
  - chamfered tips → application specific
  - surface quality → customer specific

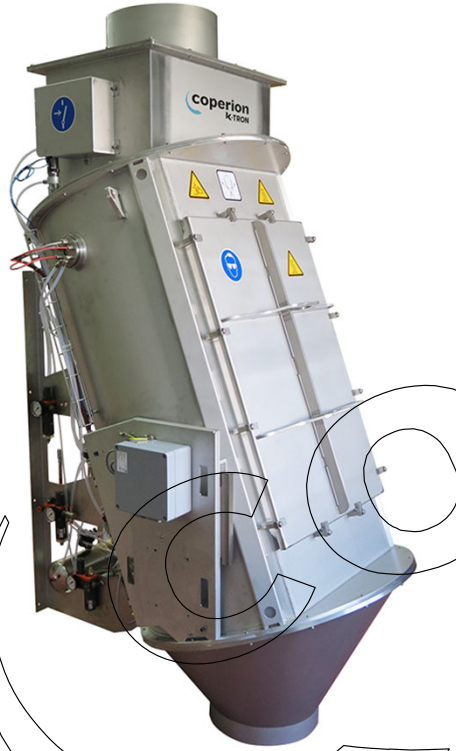
Smart Flow Meter (SFM)

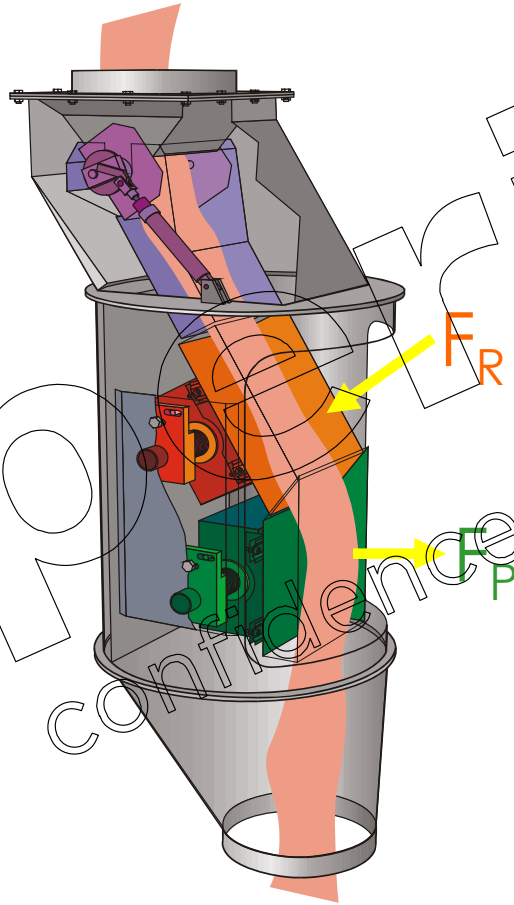


Polyolefin Production Plant - Dry End Process
Choices for the main resin feeder include a large LIW feeder, a large weigh belt feeder or a Smart Flow Meter.

Smart Flow Meter

Smart Flow Meter



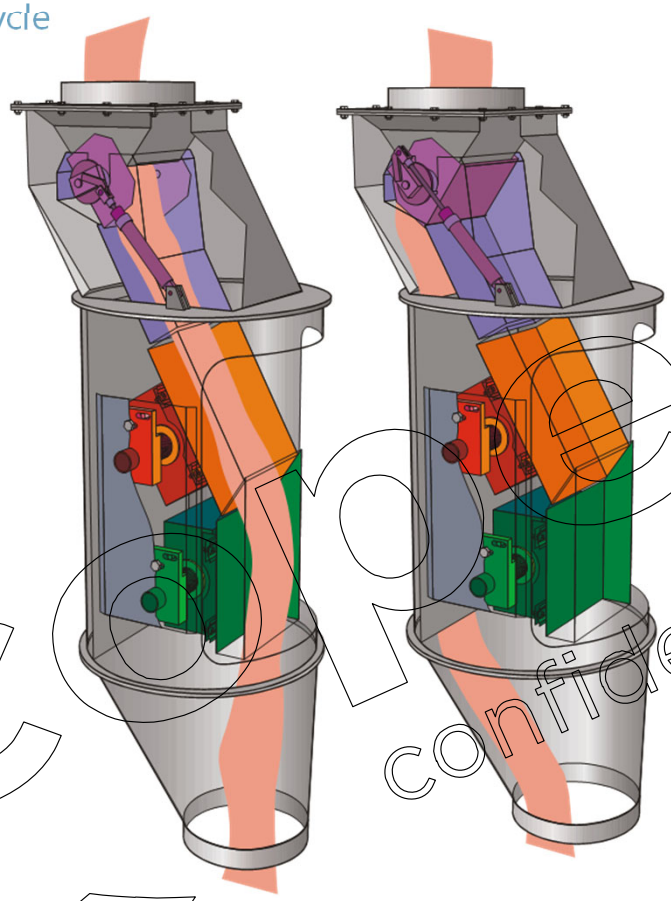


$$\text{Massflow} = \sqrt{\frac{F_R \bullet F_P \bullet (2 - \frac{F_R}{F_P} \bullet \sin\alpha)}{2 \bullet g \bullet l \bullet \cos^2\alpha}}$$

- Gentle gravity Flow.
- No moving part on SFM during material flow.
- Able to perform closed-loop feeding via rotary valve.

Smart Flow Meter

SFM Auto-Tare Cycle



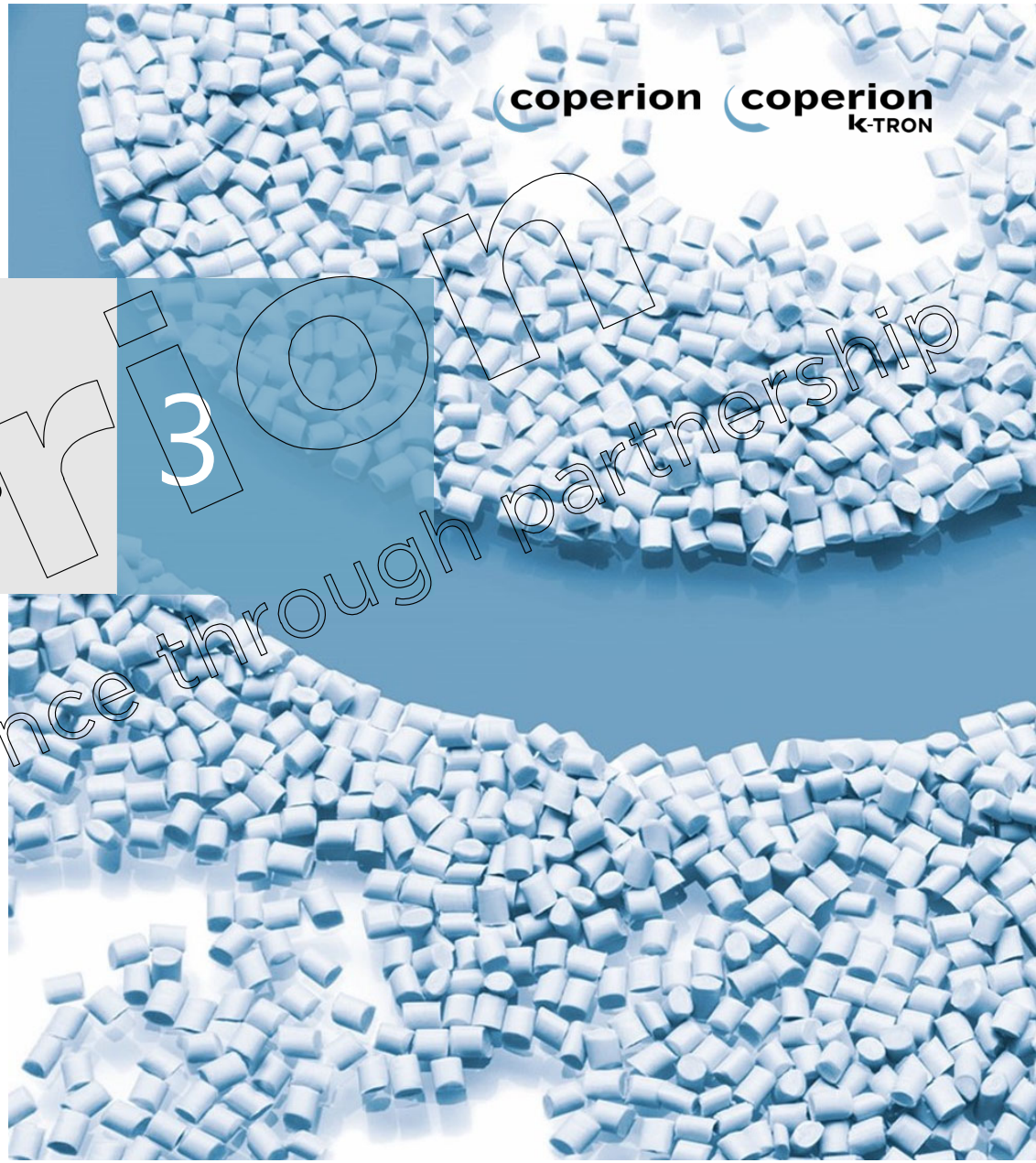
Measurement | Auto-Tare

- Scales can be easily tared anytime by diverting the flow of material from the weighed chutes to the bypass channel.
- The tare cycle is handled automatically by the controller.

Smart Flow Meter

- Video: https://www.youtube.com/watch?v=pY_SjuVj2Z0

Loss-In-Weight Additive Feeders



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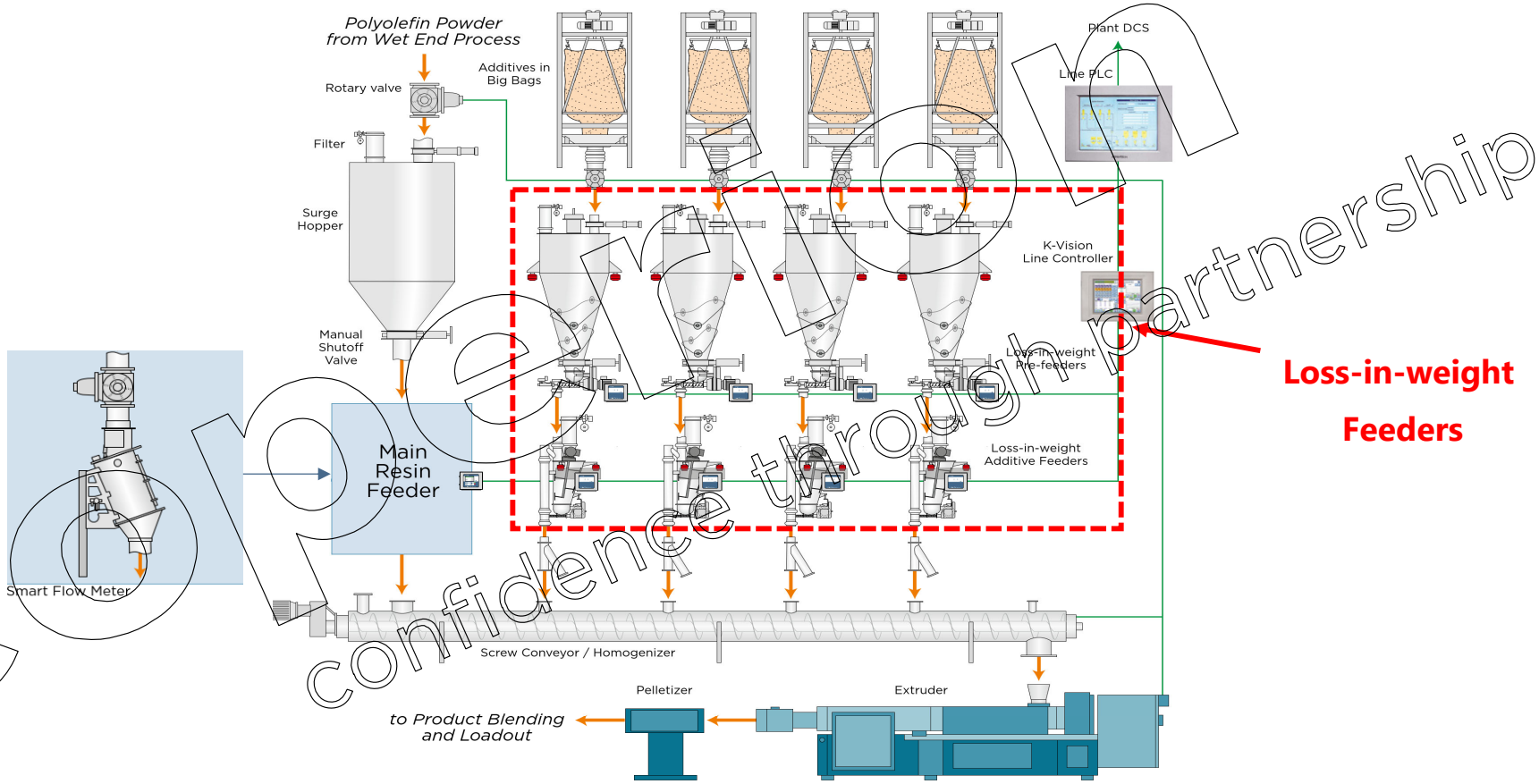


Loss-in-weight Feeders

Polyolefin Production Plant - Dry End Process

Choices for the main resin feeder include a large LIW feeder, a large weigh belt feeder or a Smart Flow Meter.

Loss-In-Weight (LIW) Additive Feeders

Single Screw

- Category
  - Single Screw Loss-in-Weight Feeder
- Materials Fed
  - Free flowing powders, granules and pellets
- Rates
  - To 45,300 dm3/h (1,600 ft3/h)
- Configurations
  - Four core models
  - platform or suspension weighing
  - modular design;
  - extensive choice of feed screw types
  - agitated hopper option

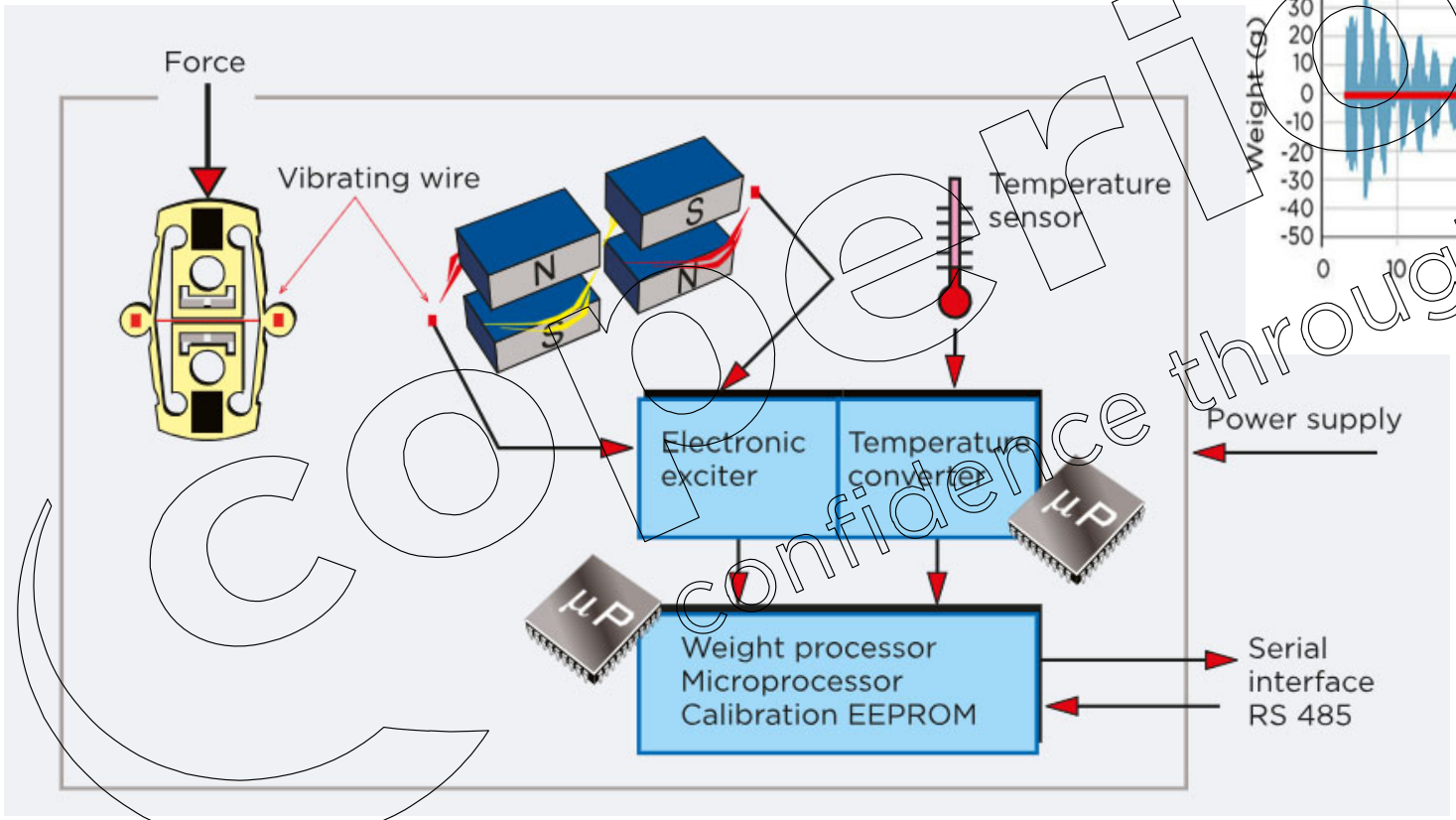
Loss-In-Weight (LIW) Additive Feeders

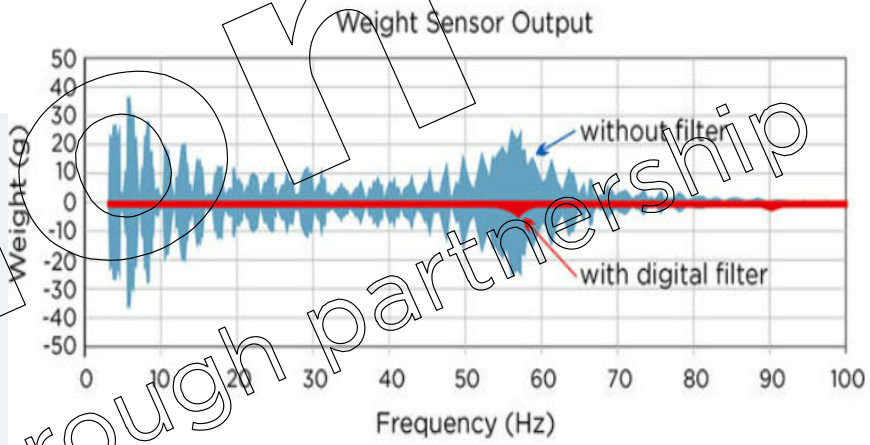
Twin Screw Feeder

- Category
  - Twin Screw Loss-in-Weight Feeder
- Materials Fed
  - Pigments, sticky, bridging or floodable powders
- Rates
  - From micro to 30,600 dm3/h (1,080 ft3/h)
- Configurations
  - Four core models
  - platform or suspension weighing
  - modular design
  - extensive choice of feed screw types and geometries
  - agitated hopper option

Technology

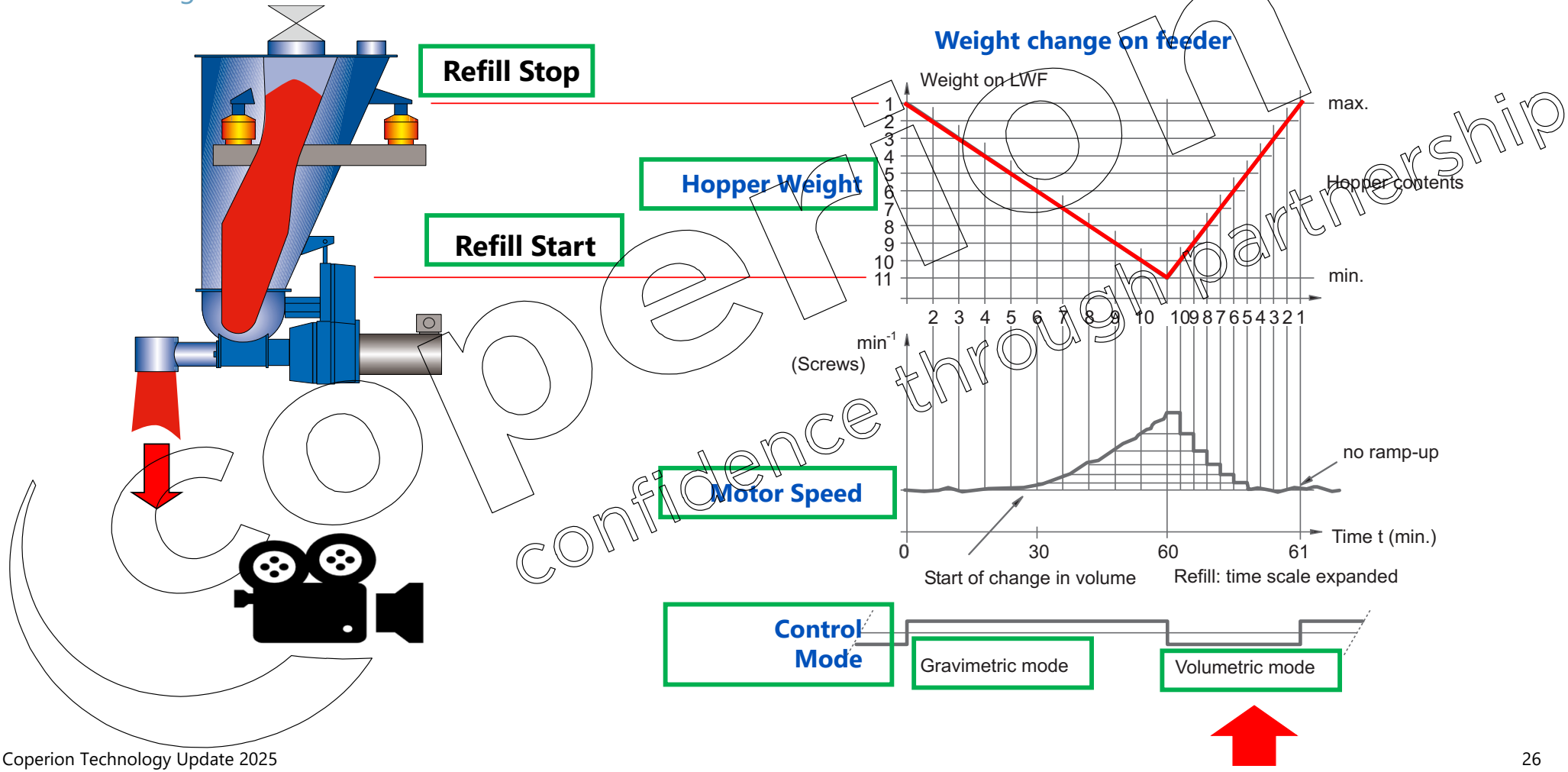
Digital Load Cell With Digital Filter





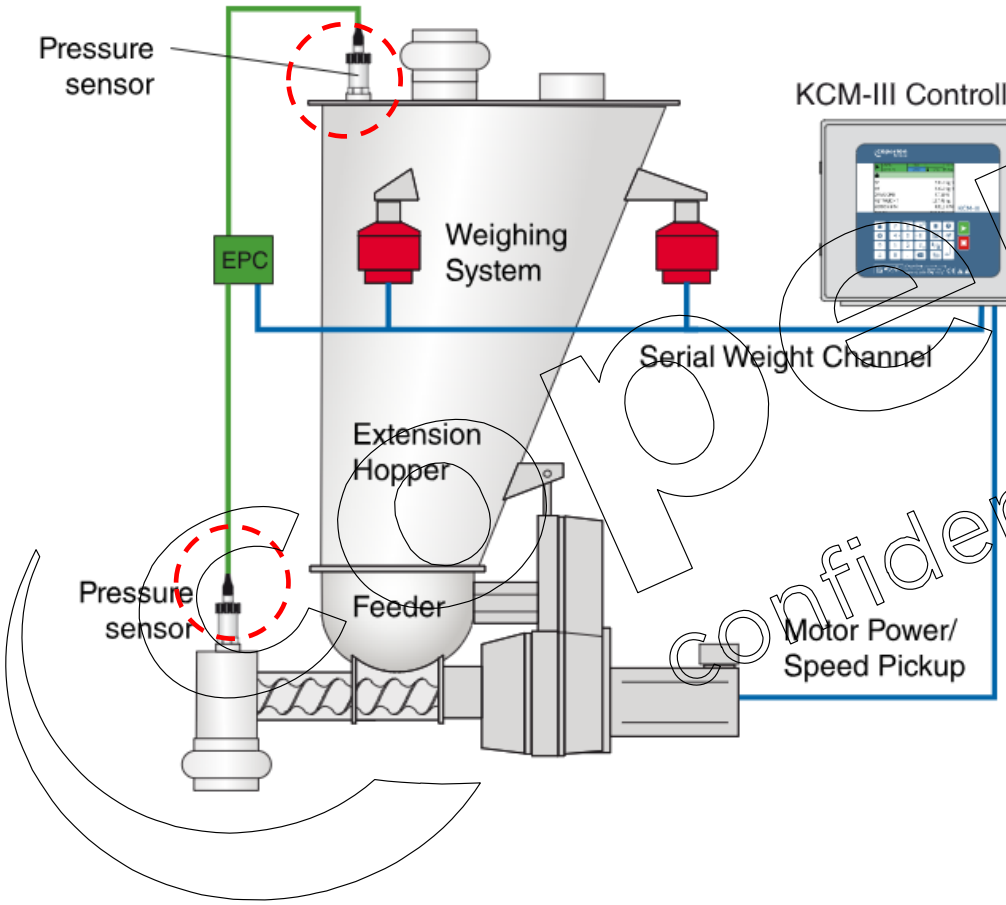
Technology

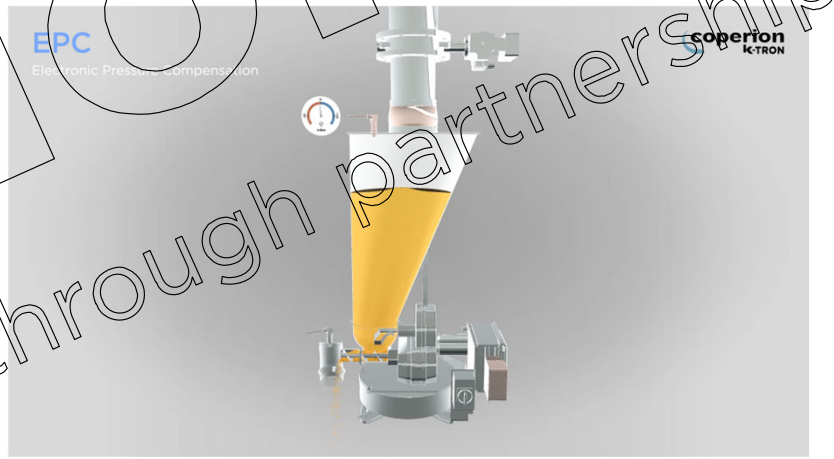
Smart Refill Algorithm



Technology

Electronic Pressure Compensation (EPC)

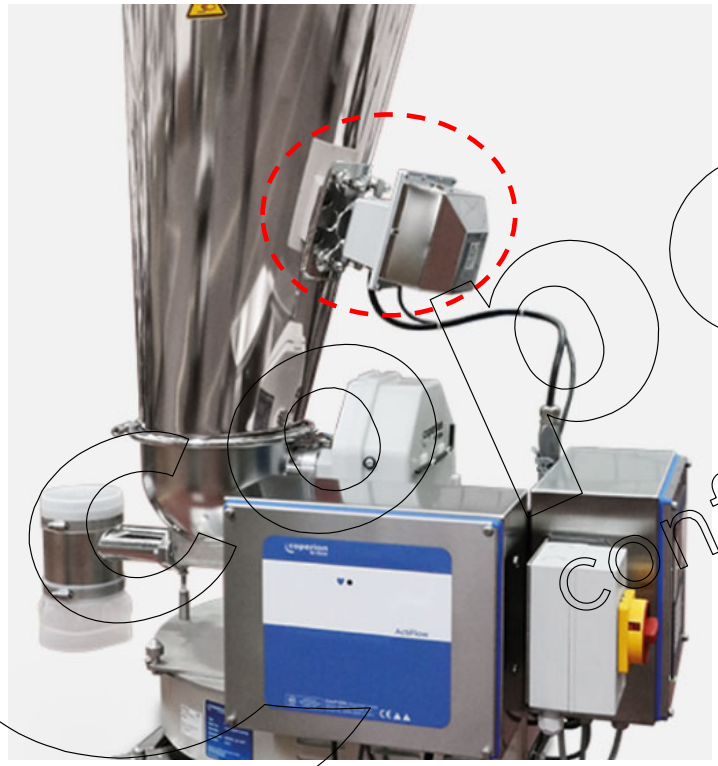


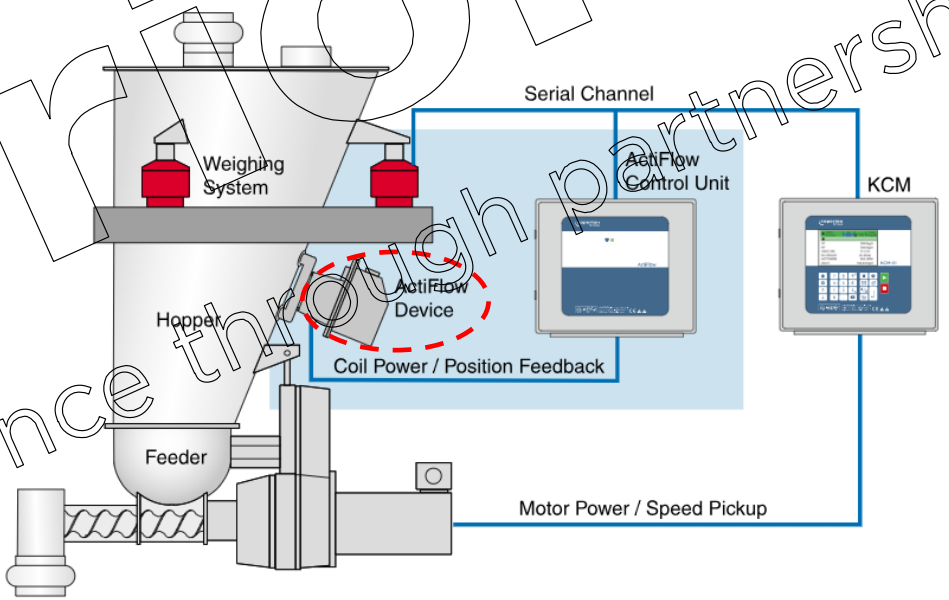


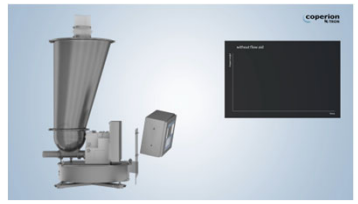
Technology

Actiflow

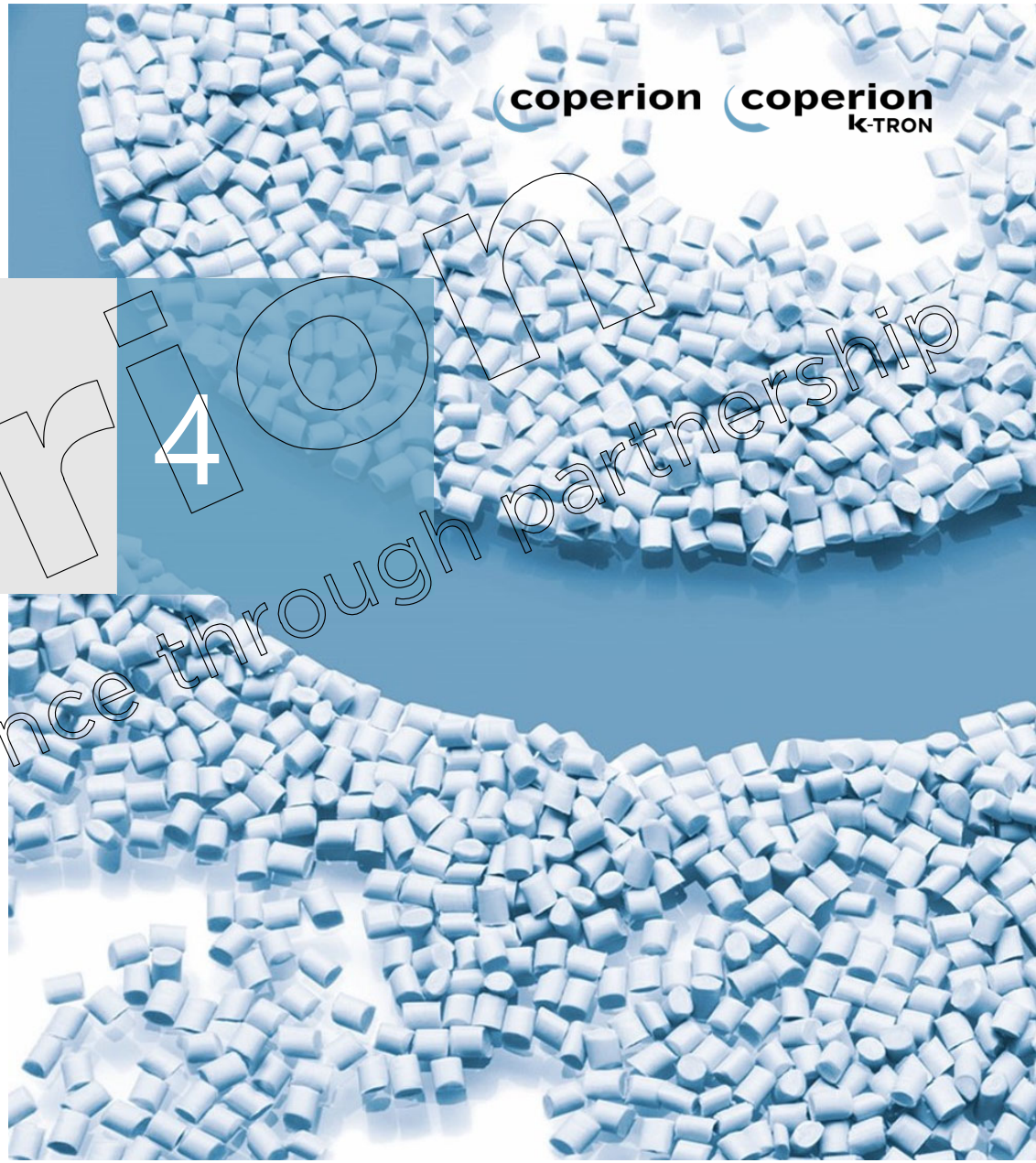
Actiflow







Additive Supply Equipment



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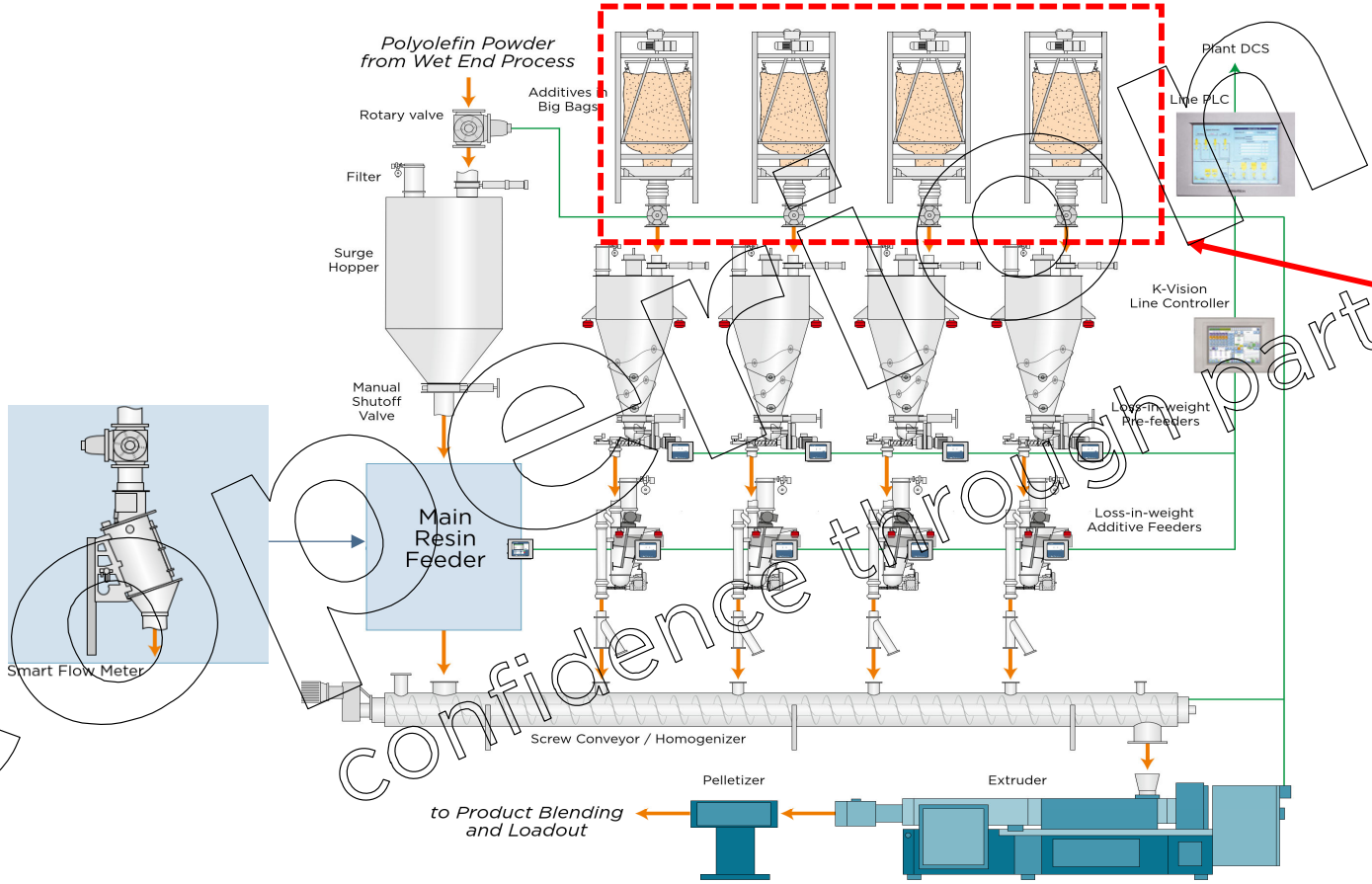


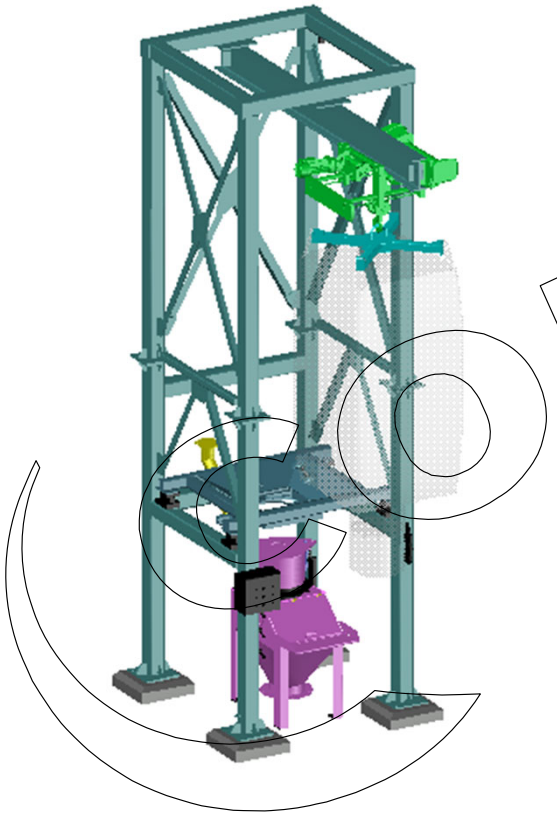
Polyolefin Production Plant - Dry End Process

Choices for the main resin feeder include a large LIW feeder, a large weigh belt feeder or a Smart Flow Meter.

Additive Supply Equipment

Additive Supply Equipment

Bulk Bag Unloader

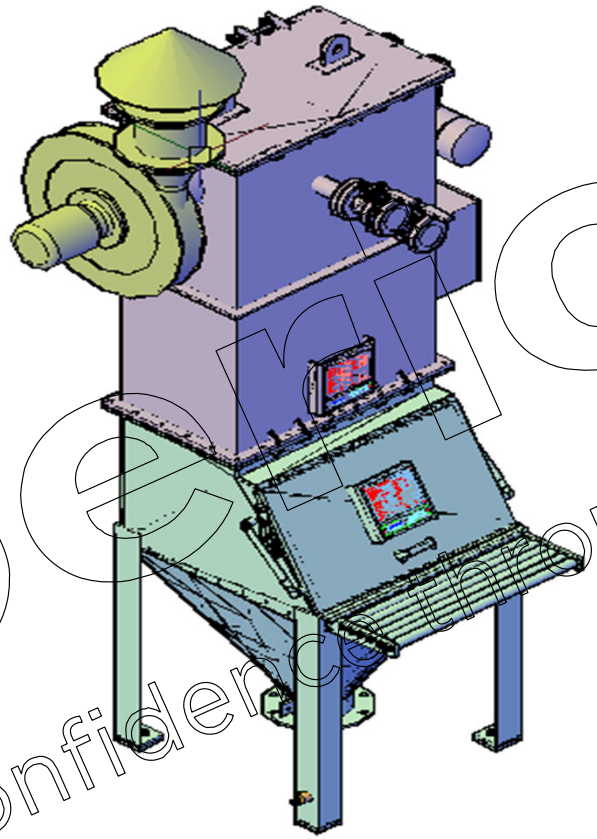


- Multiple capacity ranges
- Hazardous location options
- Hoist / gantry crane available
- Stainless steel contact parts
- Load cell options
- Multiple discharge device options

Additive Supply Equipmer

Bag Dump Station

- Dust filtration options available
- Designed to ensure a clean, dust-controlled process environment
- Multiple discharge device options
- Stainless steel construction
- Hazardous location options



Bag Dump Hopper (without filtration)

Bag Dump Station with integral dust control

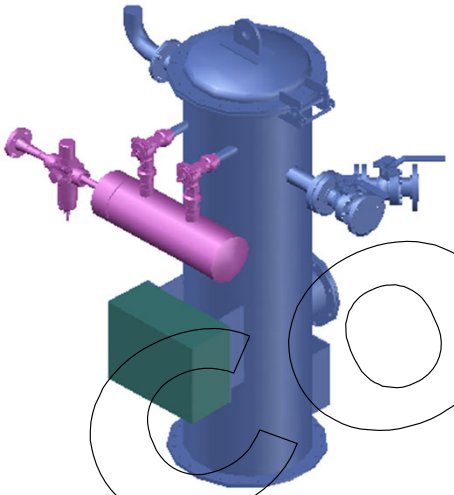
Additive Supply Equipment

Modular Cartridge Bin Vent

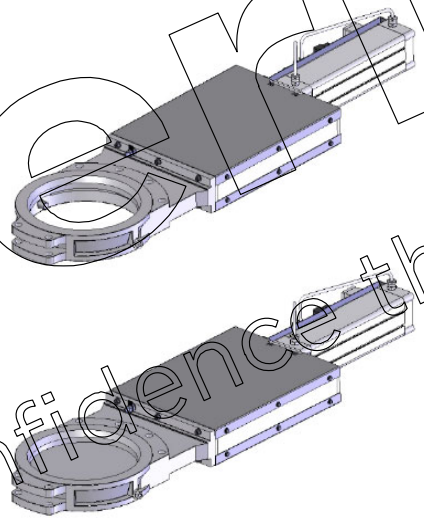
- Cost effective
- Easy installation
- Simple no-tool tank deck maintenance
- Large pulse-cleaned filter
- 9 m2 [100 ft2] cloth area
- Built in weather hood
- Add additional units easily for greater filtration

Additive Supply Equipment

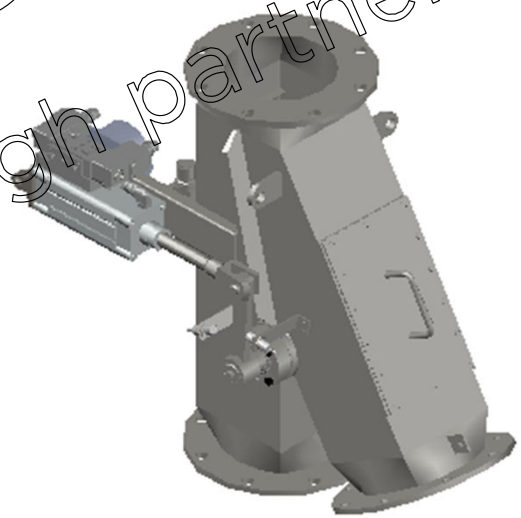
Bin Vent Filter



Slide Gate Valve



Diverter Valve



Control System

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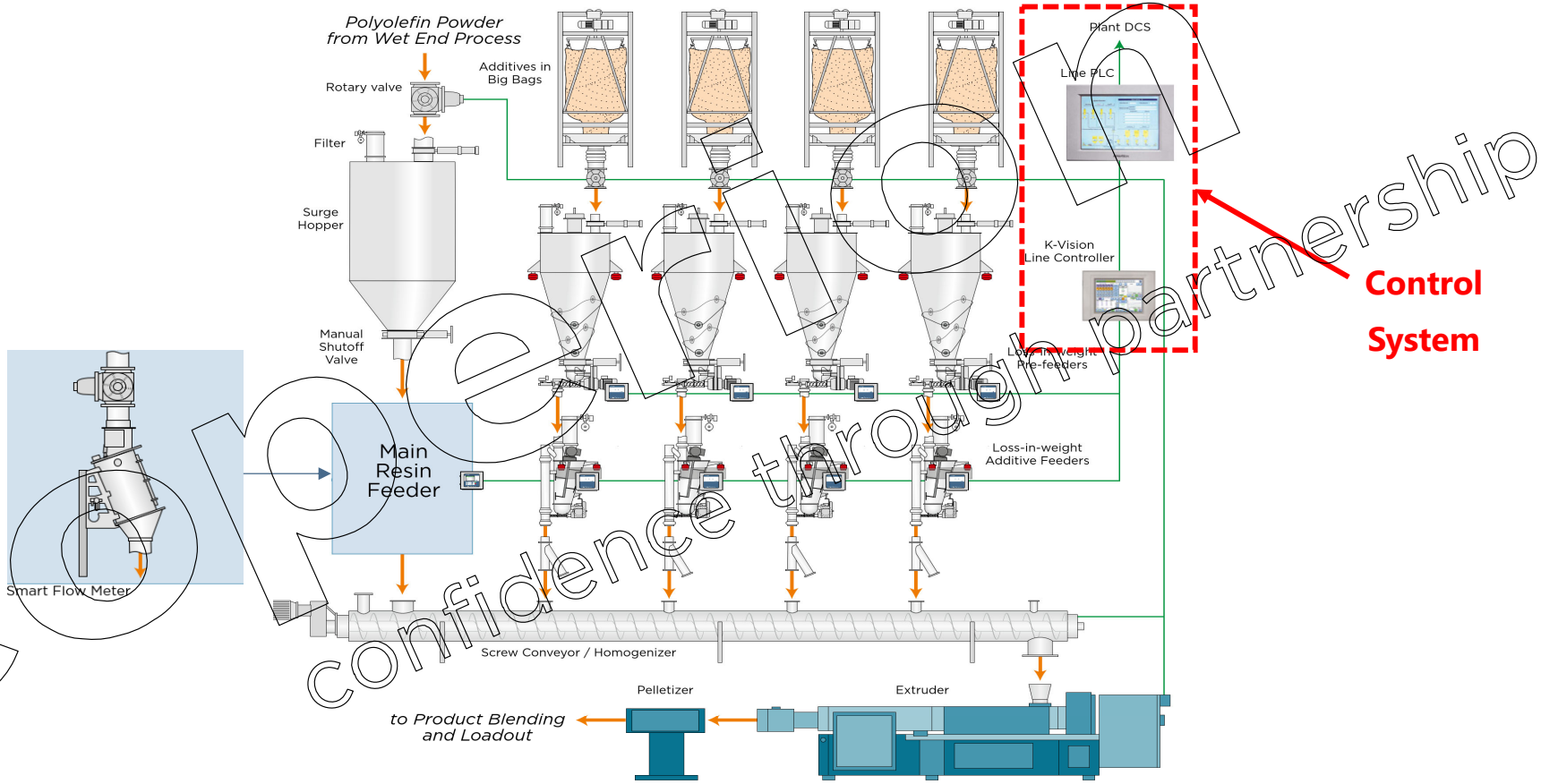

Polyolefin Production Plant - Dry End Process

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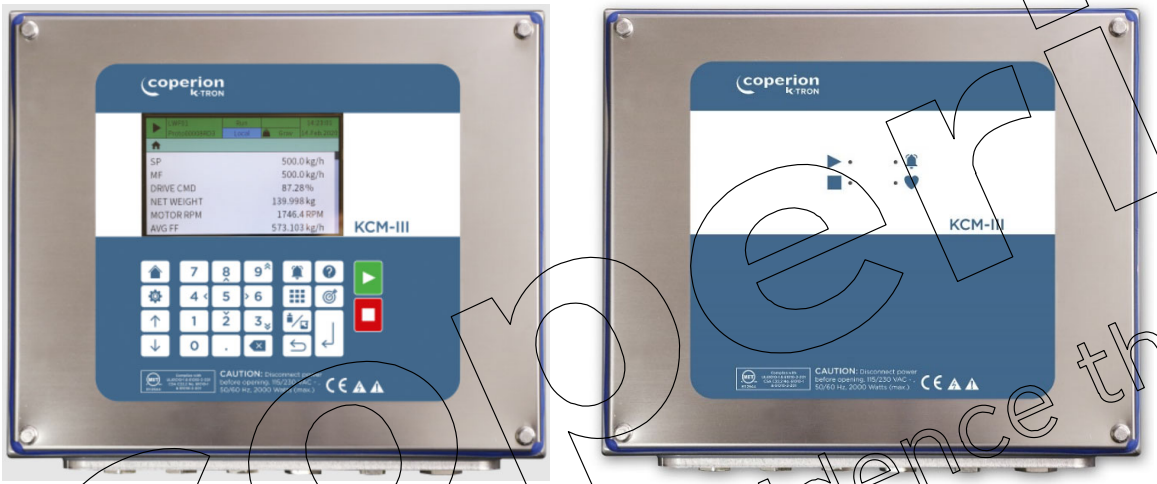
Smart Controllers

KCM-III



- 5” color LCD display
- Built-in 15 language support
- Wifi Option
- Stainless Steel AISI304 casing
- Remote mounting KCM, up to 100 m with external EMC filter on AC mains.

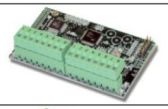
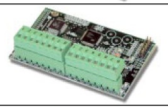
Smart Controllers

K-Vision

- 12.1 inch XGA Color TFT Display (1024 x 768 pixels)
- Built-in 15 language support
- Operator interface for max. 24 devices
- Controls up to 2 lines
- Trend graphs
- Event logging, backed up to flash memory

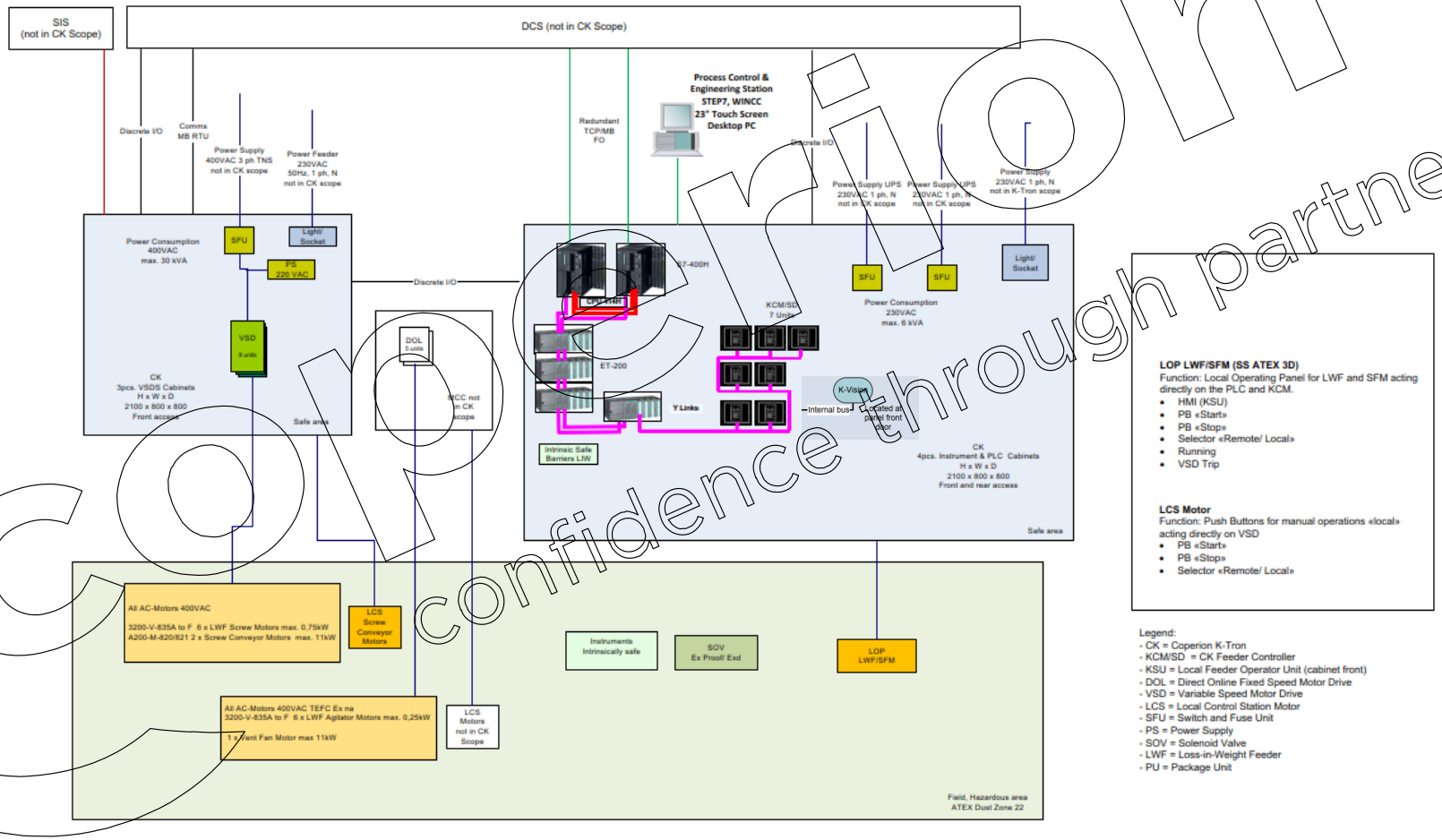
Smart Controllers

KCM-III /K-Vision Connectivity

Interface Boards	Device Interface	Max. Transfer Rate	No. of Nodes	Connection
 **Allen Bradley DF1 (CIF)** Slave	RS485 2-/4-wire (Multidrop) or RS232 (point-to-point)	19,200 bit/s	31	screw terminals
 **Modbus RTU** Slave	RS485 2-/4-wire (Multidrop) or RS232 (point-to-point)	38,400 bit/s	31 1	screw terminals
 **Modbus+** Slave	RS485 2 wire	1 Mbit/s	31	D-Sub 9 pin female
 **Modbus/TCP** Server	Ethernet	100 Mbit/s	depends on network configuration	RJ-45
 **Ethernet/IP** (Industrial Protocol) Server	Ethernet	100 Mbit/s	depends on network configuration	RJ-45
 **Profibus DP** Slave	RS485 2 wire	12 Mbit/s	126	D-Sub 9 pin female
 **DeviceNet** Slave	RS485 2 wire	500 kB/s	64	screw terminals
 **Profinet-IO** Server	Ethernet	100 Mbit/s	depends on network configuration	RJ-45

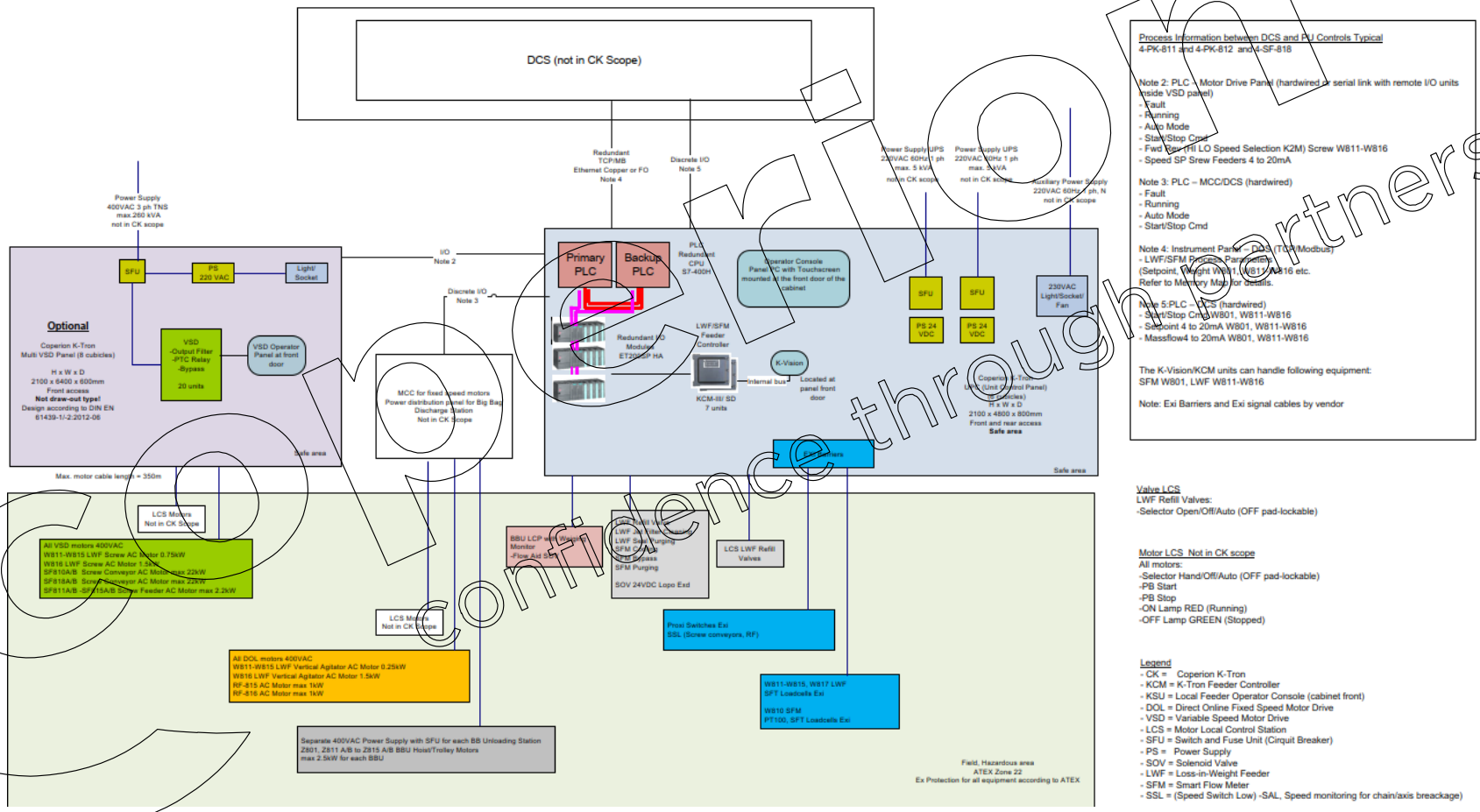
Smart Controllers

Sample Control Schematics



Smart Controllers

Sample Control Schematics



Process Information between DCS and PLC Controls Typical
4-PK-811 and 4-PK-812 and 4-SF-818

Note 2: PLC – Motor Drive Panel (hardwired or serial link with remote I/O units inside VSD panel)
- Fault
- Running
- Auto Mode
- Start/Stop Cmd
- Fwd Rev (Fill LO Speed Selection K2M) Screw W811-W816
- Speed SP Srew Feeders 4 to 20mA

Note 3: PLC – MCC/DCS (hardwired)
- Fault
- Running
- Auto Mode
- Start/Stop Cmd

Note 4: Instrument Panel – DCS (TCP/Modbus)
- LWF/SFM Process Parameters (Setpoint, Weight W801, W811-W816 etc.
Refer to Memory Map for details.

Note 5:PLC – DCS (hardwired)
- Start/Stop Cmd W801, W811-W816
- Setpoint 4 to 20mA W801, W811-W816
- Massflow4 to 20mA W801, W811-W816

The K-Vision/KCM units can handle following equipment:
SFM W801, LWF W811-W816

Note: Exi Barriers and Exi signal cables by vendor

Valve LCS
LWF Refill Valves:
-Selector Open/Off/Auto (OFF pad-lockable)

Motor LCS Not in CK scope
All motors:
-Selector Hand/Off/Auto (OFF pad-lockable)
-PB Start
-PB Stop
-ON Lamp RED (Running)
-OFF Lamp GREEN (Stopped)

Legend
- CK = Coperion K-Tron
- KCM = K-Tron Feeder Controller
- KSU = Local Feeder Operator Console (cabinet front)
- DOL = Direct Online Fixed Speed Motor Drive
- VSD = Variable Speed Motor Drive
- LCS = Motor Local Control Station
- SFU = Switch and Fuse Unit (Cirquit Breaker)
- PS = Power Supply
- SOV = Solenoid Valve
- LWF = Loss-in-Weight Feeder
- SFM = Smart Flow Meter
- SSL = (Speed Switch Low) -SAL, Speed monitoring for chain/axis breackage)

Thank you very much for your attention.