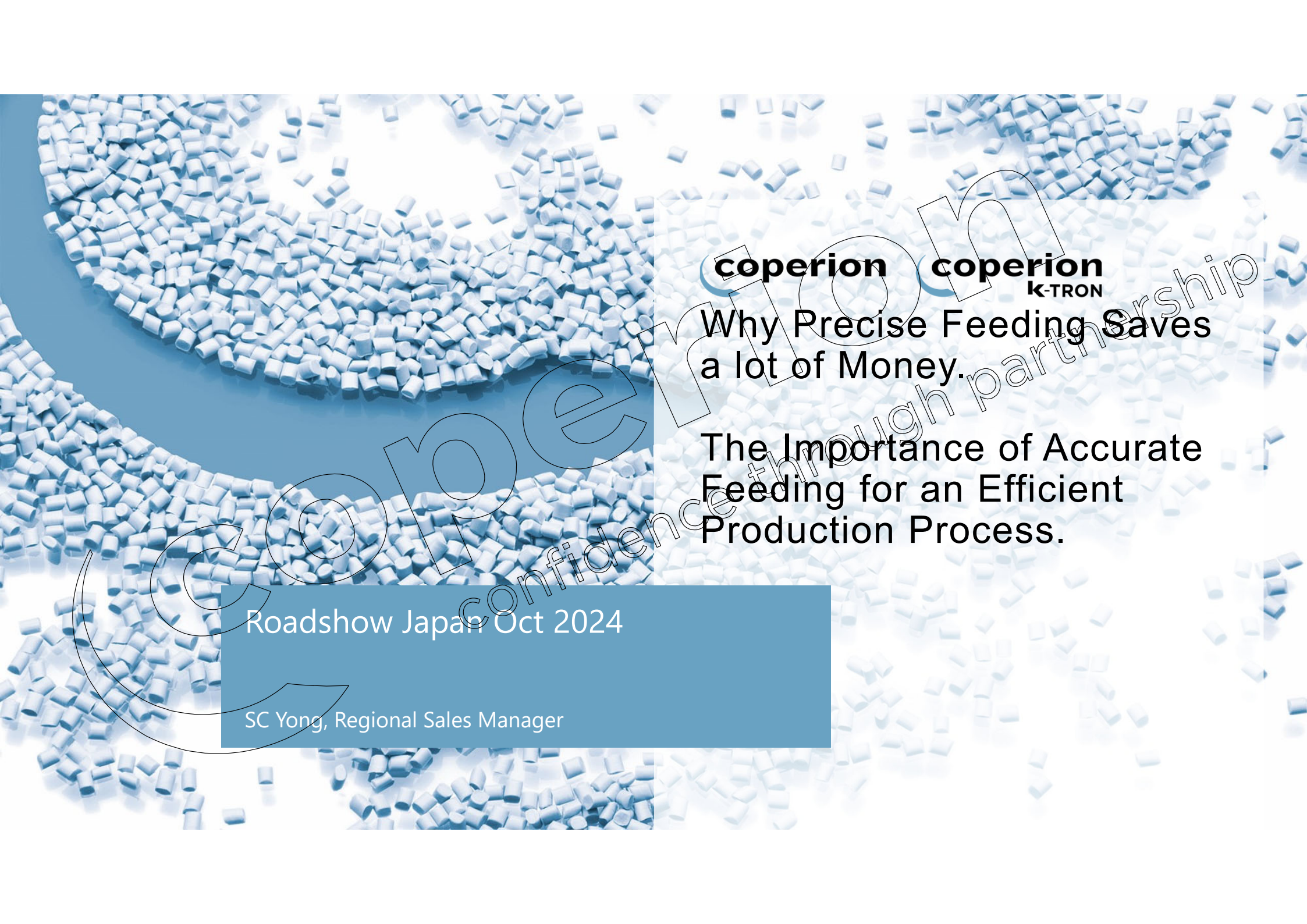




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K-TRON

Why Precise Feeding Saves
a lot of Money.

The Importance of Accurate
Feeding for an Efficient
Production Process.

Roadshow Japan Oct 2024

SC Yong, Regional Sales Manager

CHAPTERS

1 Typical Feeder Arrangement

2 Recipe Management

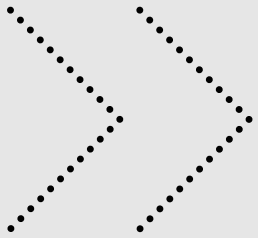
3 The Technology

4 Feeder Variety Showcase

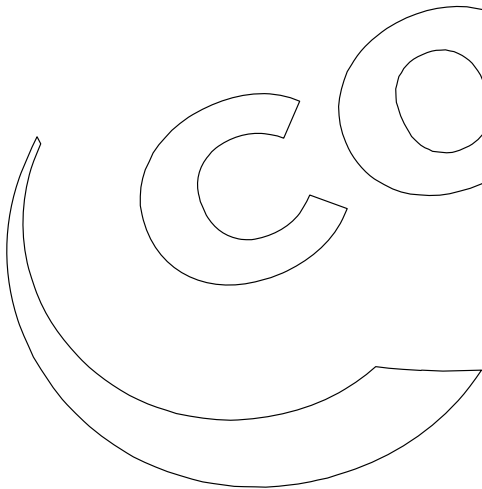
5 Smart Controllers

6 Refill Systems

7 Takeaway



Typical Feeder Arrangement



Engineering Plastic Seminar 2024

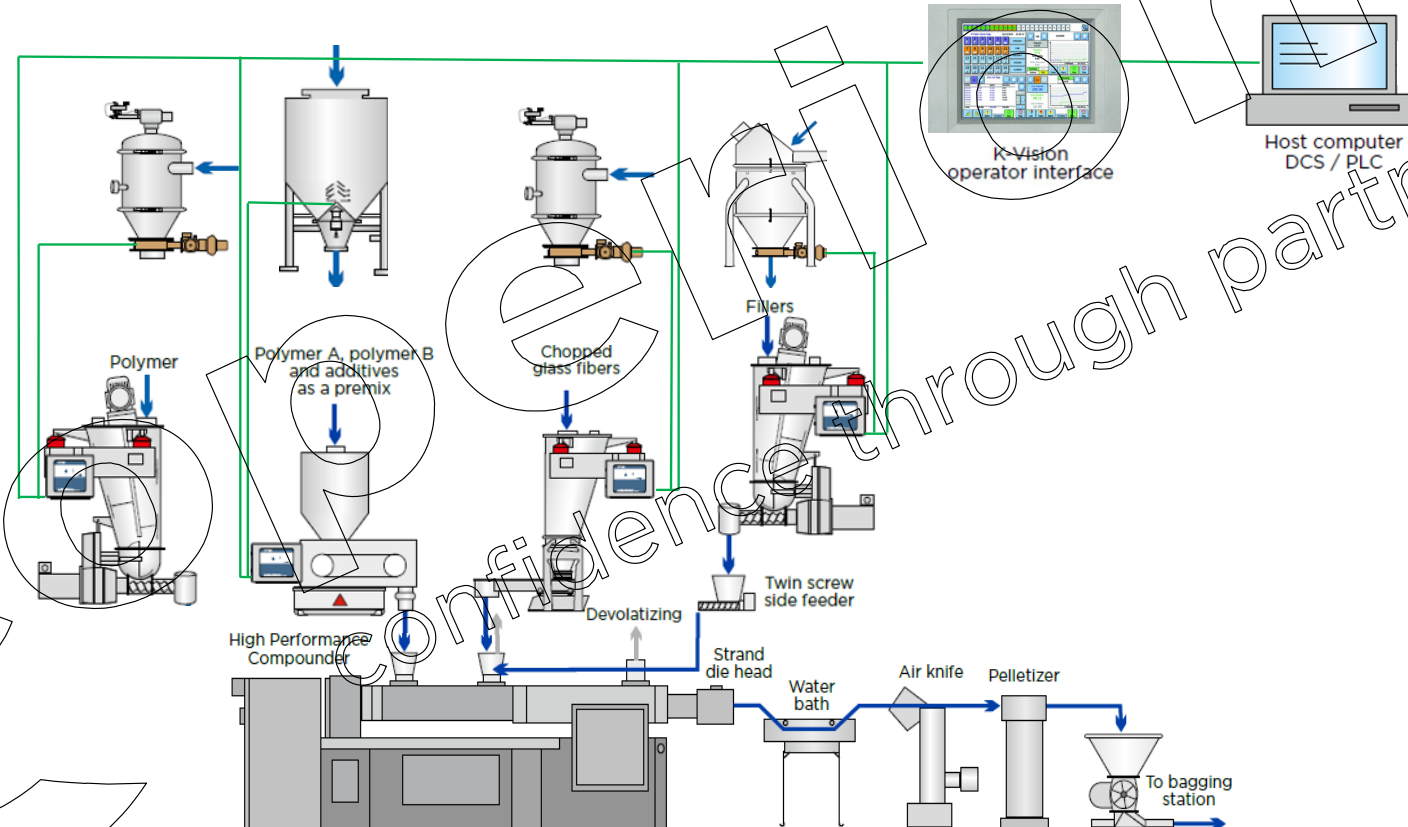
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confidence through partnership

Typical Feeder Arrangement

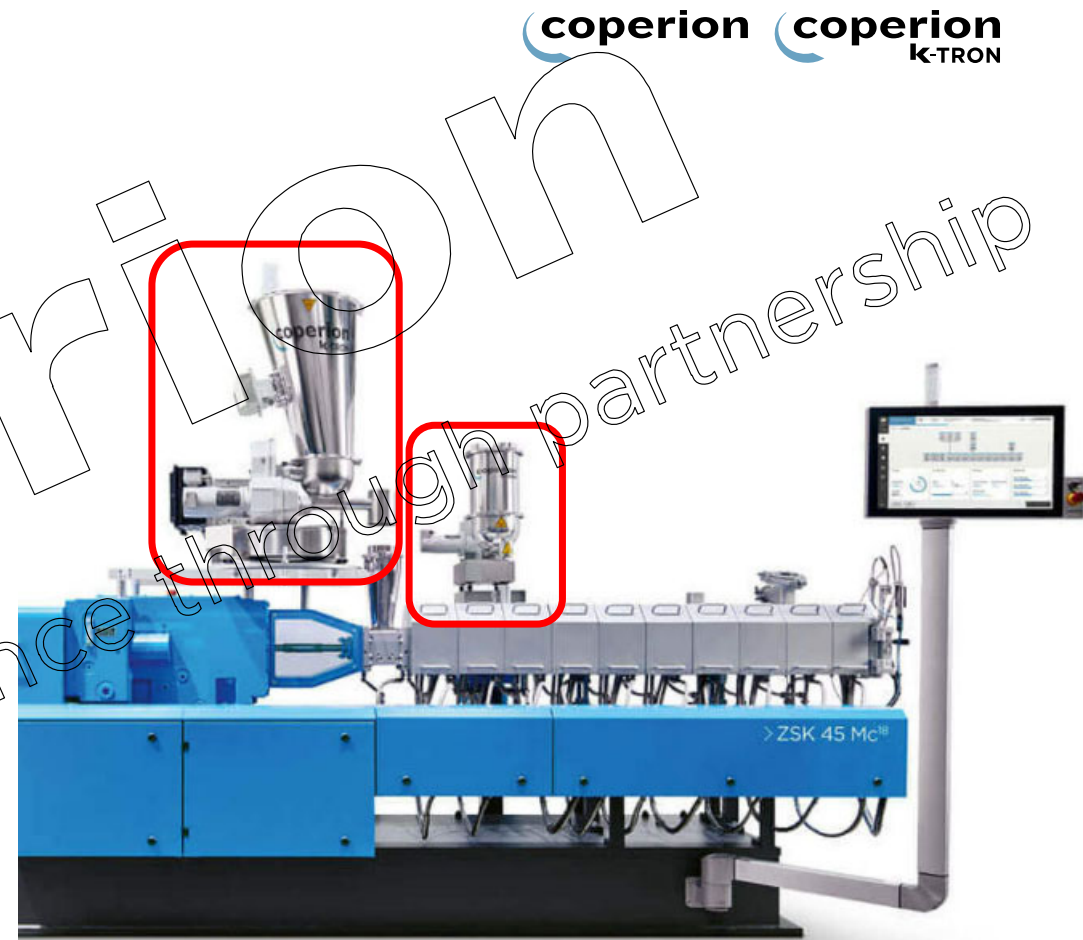
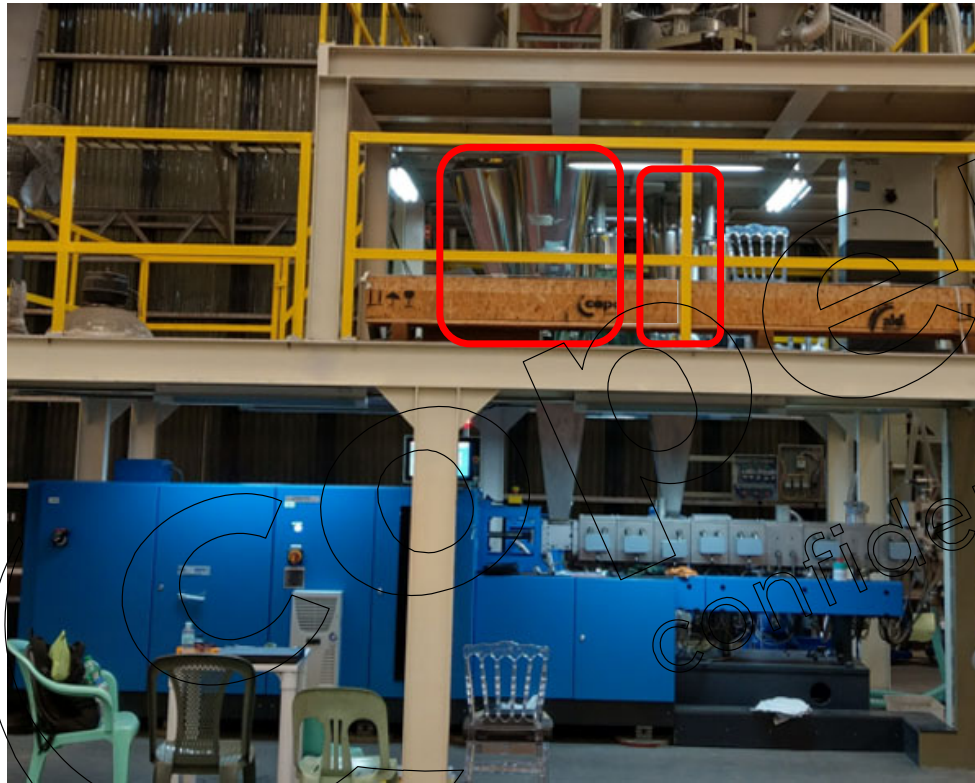
Sample Flow Diagram

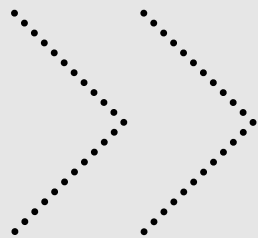
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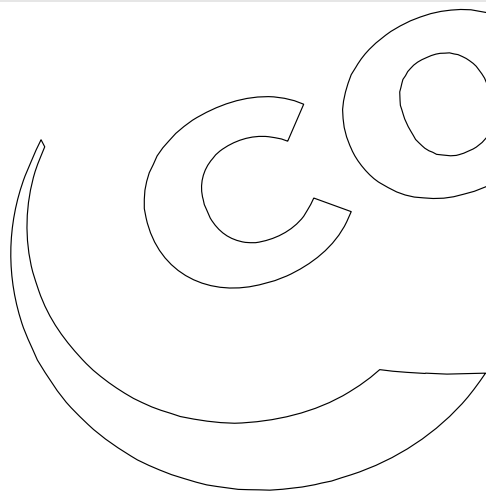
Typical Feeder Arrangement

Sample Site Photos





Recipe Management



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2

confidence through partnership

Recipe Management

Sample Recipe On Compounding

Fdr #	Material	Type	Min %	Max %	Min BD l/kg	Max BD l/Kg	Min Rate kg/ hr	Max Rate kg/ hr	Min Rate l/ hr	Max Rate l/ hr	Feeder Model	Hopper Size	Refill Per Hour
1	Plastic Resin	pellet	15	80	0.4	1	75	400	75	1000	K2-ML-D5-S60	110	8
2	Glass Fiber	fiber	10	50	0.27	0.35	50	250	142.9	925.93	K3-ML-D5-V200	110	8
3	Flame retardant	powder	10	50	0.6	1.6	50	250	31.25	416.67	K2-ML-D5-T35	110	4
4	Filler (CaCo3, BaSo4, talc, silica, mica)	Powder/ flakes	10	50	0.16	1	50	250	50	1562.5	K2-ML-T60	160	9
5	Processing additive mix (AO, dispersant) + pigment	powder	0.5	15	0.4	2.1	2.5	75	1.19	187.5	K2-ML-D5-T35	50	4
6	Modifying additive mix (UV powder, slip powder, PPA powder, coupling agent pellets)	Powder+ pellet	0.5	30	0.3	1	2.5	150	2.5	500	K2-ML-D5-S60	110	4
7	Recyled plastic	flake/ pellet	5	80	0.3	1.2	25	400	20.83	1333.3	K2-ML-S60	180	7
8	Liquid	liquid	1	3	1	1	2.5	250	2.5	250	LLW	60	4

Recipe Management

Hourly Cost Elements

Extrusion Rate, kg/h = 1000

Unit Material Cost, \$/kg = 3

On-line Production Time/Uptime, % = 85

A) Hourly Material Cost, \$/h = Extrusion Rate, kg/h x Unit Material Cost, \$/kg x Uptime

1,000	kg/h
3	\$/kg
85	%
2,550	\$/h

Reject or Waste Rate, % = 1

B) Hourly Waste or Reject Cost, \$/h = 2550*0.01

25.50	\$/h
-------	------

Recipe Changeover Downtime (Ignore Labor), % = 15

Unit Material Sell Price, \$/kg = 5

C) Hourly Production Loss By Changeover, \$/h = Extrusion Rate kg/h x Recipe changeover downtime % x (Sell Price - Cost)

15	%
5	\$/kg
300	\$/h

Equipment acquisition cost, \$ = 100,000

Equipment life expectancy, year = 10

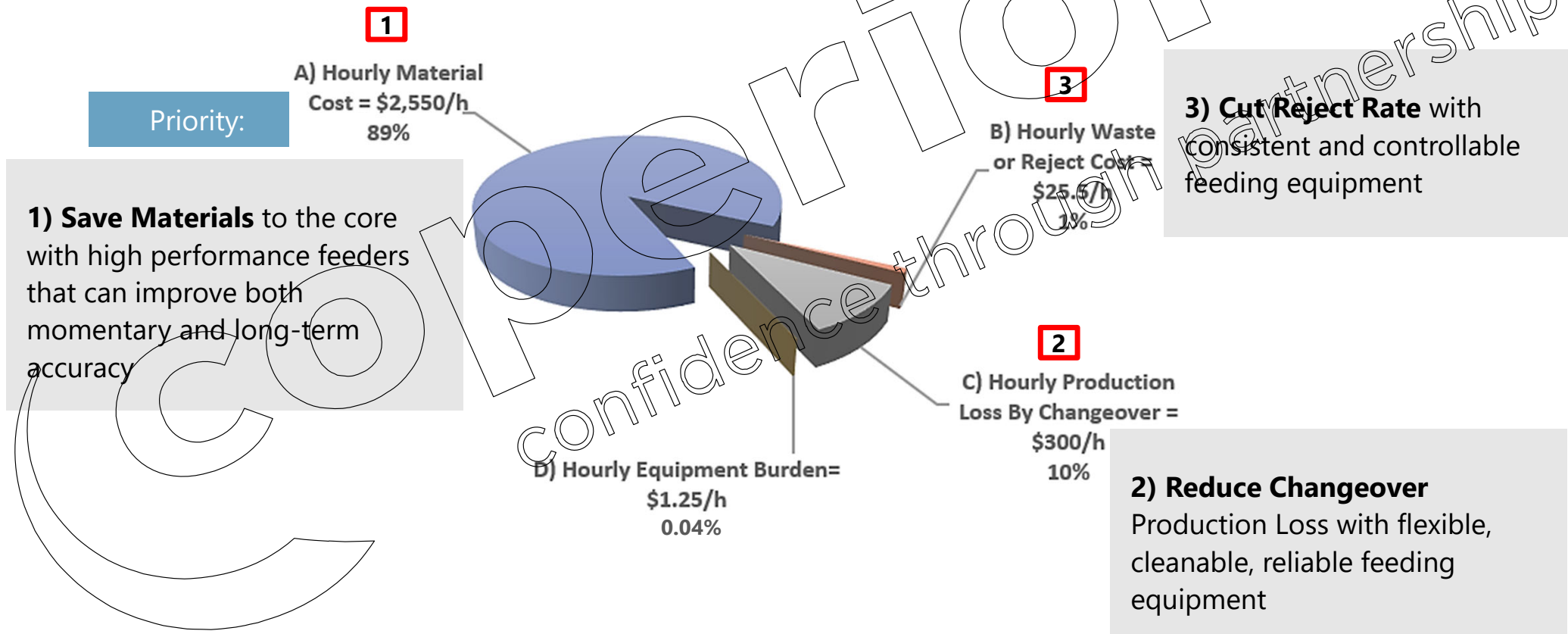
Operating hours per year = 8000

D) Hourly Equipment Burden, \$/h = Equipment Acquisition Cost, \$ / 10 years /8000 hours

100,000	\$
10	year
8,000	h/y
1.25	\$/h

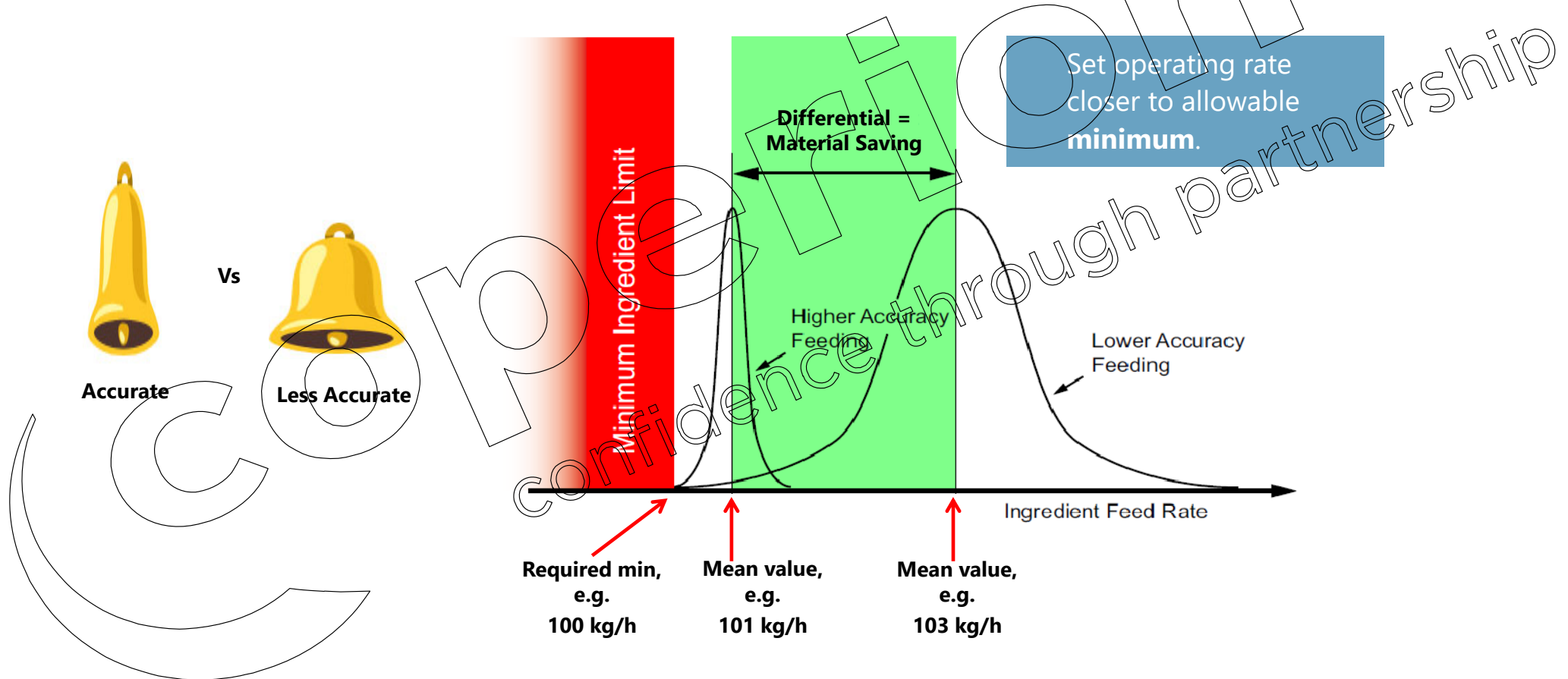
Recipe Management

Hourly Cost Elements Summary



Recipe Management

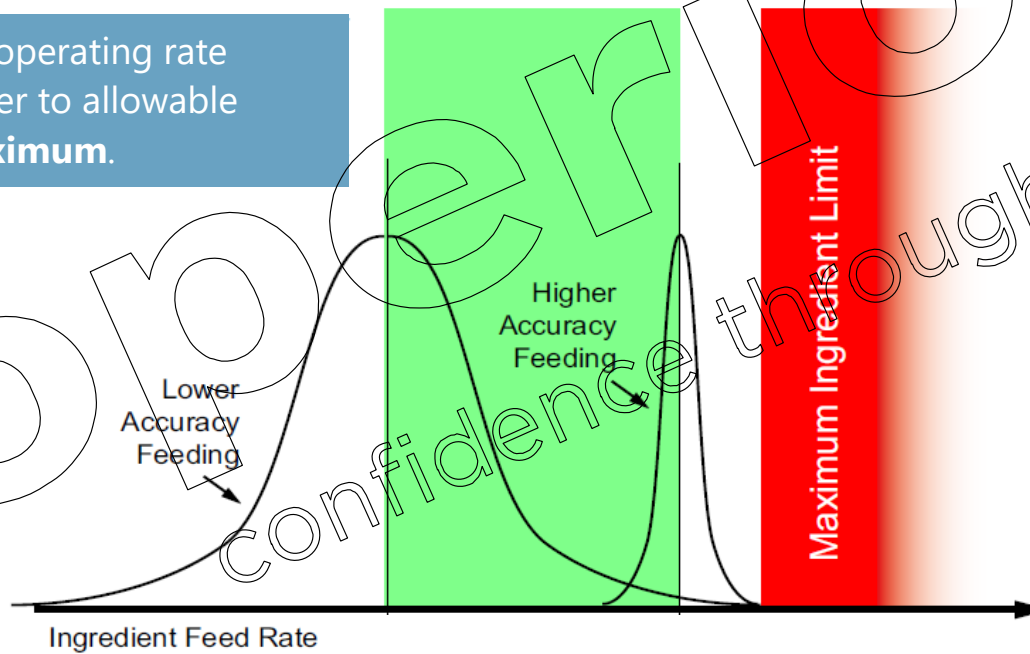
Minimize **EXPENSIVE** Or Critical Materials



Recipe Management

Maximize **INEXPENSIVE** Or Non-critical Materials

Set operating rate
closer to allowable
maximum.



Recipe Management

Recipe Optimization Program As A Whole

Original Recipe Data Entry							Allowable Proportions (%)		Fdr Accuracy
No	Ingredient Name	Cost Rank	Ingredient Unit Cost (\$/kg)	Recipe Prop (%)	Rate (kg/hr)	Cost (\$/hr)	Minimum (%)	Maximum (%)	+/- % Ing Rate
1	Resin	6	0.2200	45.00	450.00	99.00	41.00	48.00	1.00
2	Filler A	4	0.5000	30.00	300.00	150.00	27.00	33.00	1.00
3	C. Agent	5	0.3400	10.00	100.00	34.00	9.00	11.00	1.00
4	AO powder	2	1.2000	8.00	80.00	96.00	7.20	8.80	1.00
5	MB	3	0.6000	3.00	30.00	18.00	2.70	3.30	1.00
6	Pigment	1	3.5500	4.00	40.00	142.00	3.60	4.40	1.00
Total				100.00	1,000.00	539.00			

CASE A = Cost-Minimized Recipe at Current Feeder Performance						Case A vs Original Recipe Differences			
No	Ingredient Name	Cost Rank	Ingredient Status	Recipe Prop (%)	Rate (kg/hr)	Cost (\$/hr)	Recipe Prop (%)	Rate (kg/hr)	Cost (\$/hr)
1	Resin	6	Maximized	47.50	475.00	104.50	2.50	25.00	5.50
2	Filler A	4	In-Range	27.95	279.50	139.75	-2.05	-20.50	-10.25
3	C. Agent	5	Maximized	10.80	108.00	36.72	0.80	8.00	2.72
4	AO powder	2	Minimized	7.33	73.30	87.96	-0.67	-6.70	-8.04
5	MB	3	Minimized	2.75	27.50	16.50	-0.25	-2.50	-1.50
6	Pigment	1	Minimized	3.67	36.70	130.29	-0.33	-3.30	-11.71
Total				100.00	1,000.00	515.72	0.00	0.00	-23.28

Saving

515.72 - 539.00 = -\$23.28/h

Saving of **-\$186,240** per Year

(By Recipe Optimization Program)

Recipe Management

With Better Accuracy Feeders

Original Recipe Data Entry

No	Ingredient Name	Cost Rank	Ingredient Unit Cost (\$/kg)	Recipe Prop (%)	Rate (kg/hr)	Cost (\$/hr)	Allowable Proportions (%)		Fdr Accuracy +/- % Ing Rate
							Minimum (%)	Maximum (%)	
1	Resin	6	0.2200	45.00	450.00	99.00	41.00	48.00	0.50
2	Filler A	4	0.5000	30.00	300.00	150.00	27.00	33.00	0.50
3	C. Agent	5	0.3400	10.00	100.00	34.00	9.00	11.00	0.50
4	AO powder	2	1.2000	8.00	80.00	96.00	7.20	8.80	0.50
5	MB	3	0.6000	3.00	30.00	18.00	2.70	3.30	0.50
6	Pigment	1	3.5500	4.00	40.00	142.00	3.60	4.40	0.50
Total				100.00	1,000.00	539.00			

CASE A = Cost-Minimized Recipe at Current Feeder Performance

No	Ingredient Name	Cost Rank	Ingredient Status	Recipe Prop (%)	Rate (kg/hr)	Cost (\$/hr)	Recipe Prop (%)	Rate (kg/hr)	Cost (\$/hr)
1	Resin	6	Maximized	47.75	477.50	105.05	2.75	27.50	6.05
2	Filler A	4	In-Range	27.72	277.20	138.60	-2.28	-22.80	-11.40
3	C. Agent	5	Maximized	10.90	109.00	37.06	0.90	9.00	3.06
4	AO powder	2	Minimized	7.27	72.70	87.24	-0.73	-7.30	-8.76
5	MB	3	Minimized	2.73	27.30	16.38	-0.27	-2.70	-1.62
6	Pigment	1	Minimized	3.63	36.30	128.87	-0.37	-3.70	-13.13
Total				100.00	1,000.00	513.20	0.00	0.00	-25.80

>> Saving

513.20 - 539.00 = -\$25.80/h

Saving of **-\$206,400** per Year

(Further using better accuracy feeder, +/- 0.5% versus +/- 1% feeder)

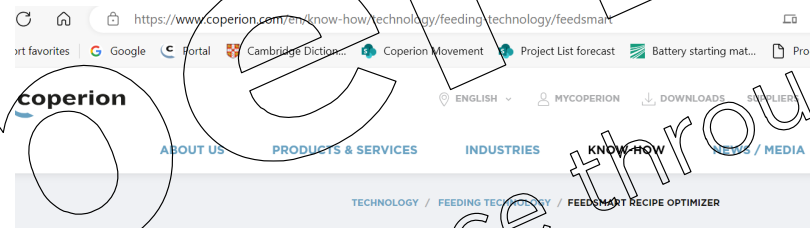
Recipe Management

Feedsmart Recipe Optimizer



>> Downloadable at the following link

<https://www.coperion.com/en/know-how/technology/feeding-technology/feedsmart>



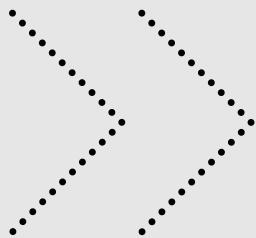
FeedSmart Recipe Optimizer

Capture savings hidden in your process recipes

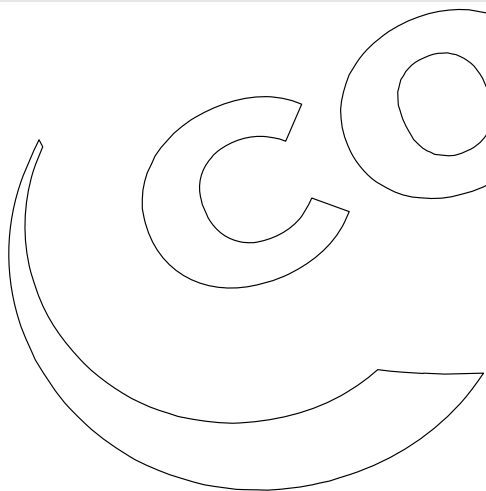


THE TOTAL SAVINGS SOLUTION

The **FeedSmart™ Recipe Optimizer** i



The Technology



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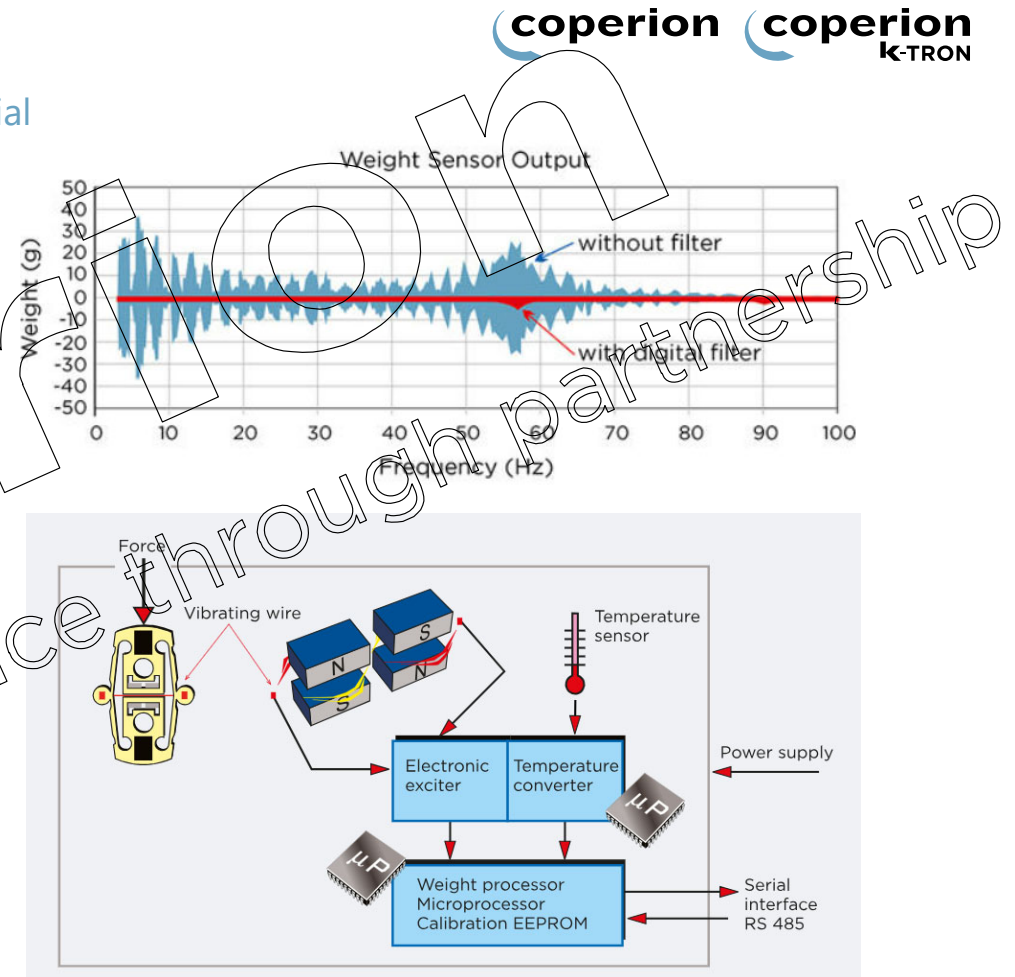
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3

confidence through partnership

Technology

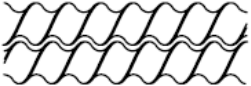
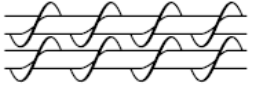
Digital Load Cell With Digital Filter – Saving No. 1 Hourly Material



Technology

Proven Showcase of Accuracy, with Microfeeder MT12 – Saving No. 1 Hourly Material

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		Twin concave screws	Twin auger screws	Screw speed range
Pitch				
coarse	dm ³ /h	0.078 - 10.36	0.076 - 10.71	RPM 1 - 150
	ft ³ /h	0.0028 - 0.3656	0.0027 - 0.3781	
fine	dm ³ /h	0.045 - 5.89	0.031 - 4.52	RPM 1 - 150
	ft ³ /h	0.0016 - 0.2079	0.0011 - 0.1595	

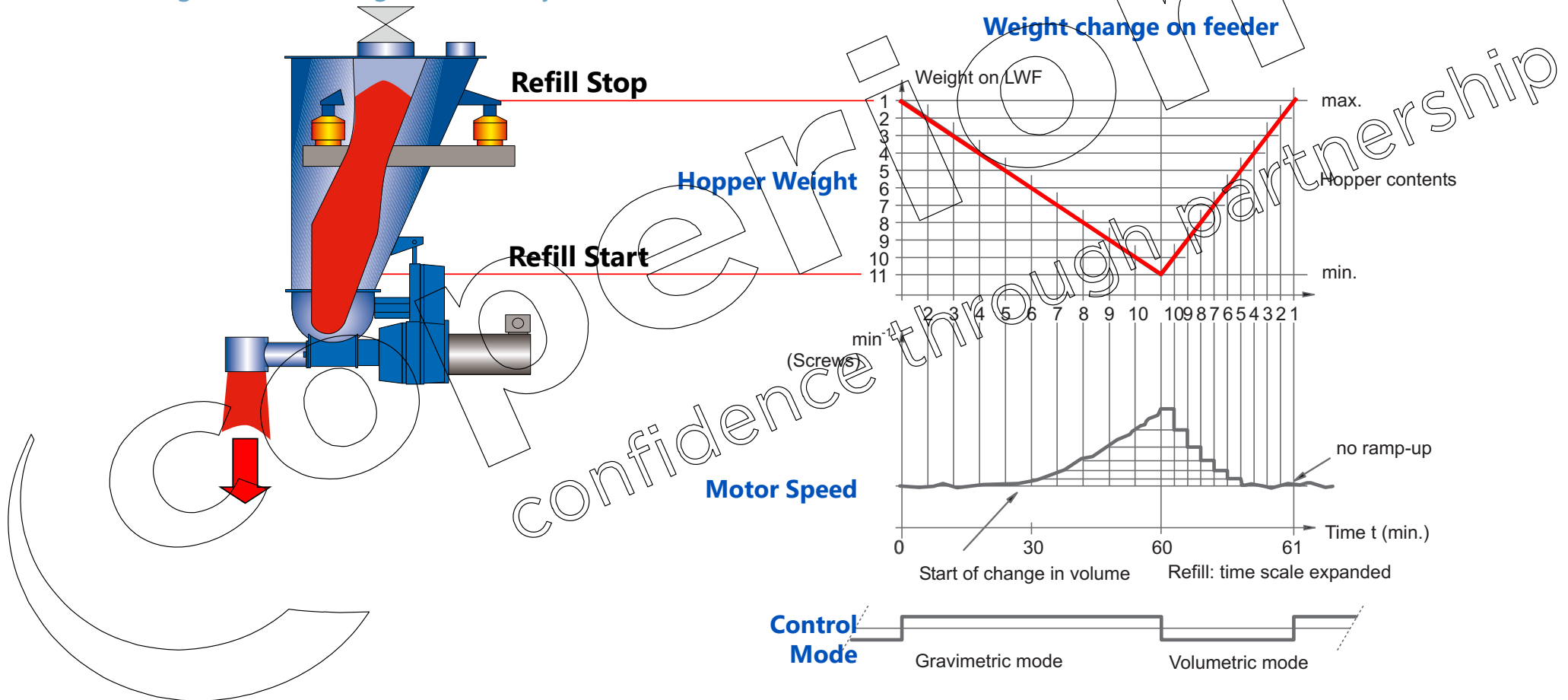
Minimum rate at 0.031 dm³/h,
Assumed bulk density 0.5 kg/dm³
15 grams per hour.
250mg per minute

Weight of half a Paracetamol pill
in a minute



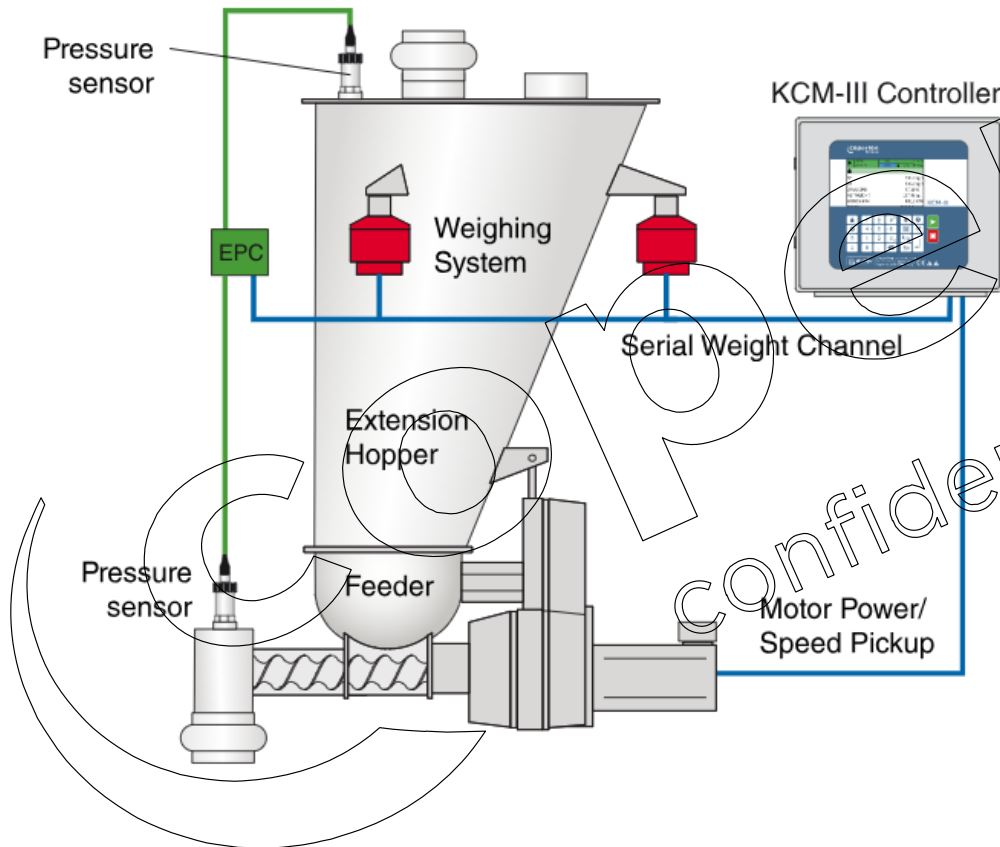
Technology

Smart Refill Algorithm – Saving No. 1 Hourly Material



Technology

Electronic Pressure Compensation – Saving No. 1 Hourly Material



Technology

The Package Of Versatility – Reducing No. 2 Hourly Changeover Loss



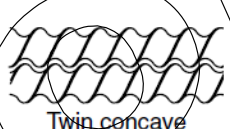
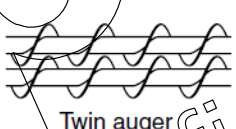
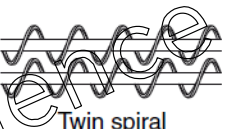
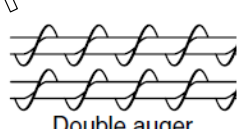
Unprecedentedly High Turndown Ratio

Example:

$$2267/5.2 = 436!$$

(Maximum is 436 times of minimum)

The possibility of using the same feeder to feed different material when Line recipe changed

Pitch		 Twin concave screws	 Twin auger screws	 Twin spiral screws	 Double auger screws
coarse pitch	dm³/h	2.9 - 1417	5.2 - 2267	3.4 - 1398	4.3 - 1712
	ft³/h	0.1 - 50.02	0.18 - 80.03	0.12 - 49.35	0.15 - 60.43
fine pitch	dm³/h	2.1 - 920	2.4 - 1370	1.82 - 1023	2.4 - 1254
	ft³/h	0.07 - 32.48	0.08 - 48.36	0.06 - 36.11	0.08 - 44.27

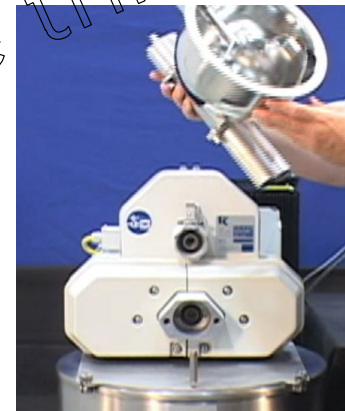
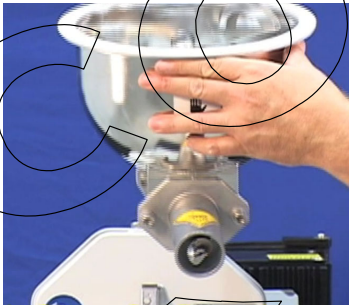
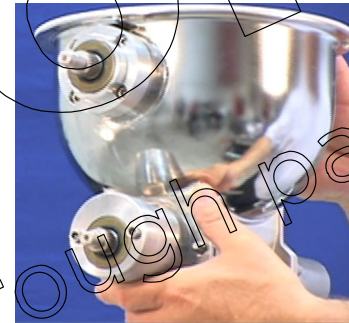
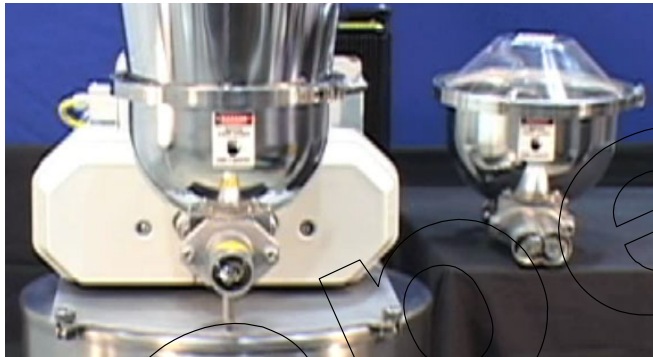


Technology

The Package Of Versatility – Reducing No. 2 Hourly Changeover Loss

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Quick Change Module

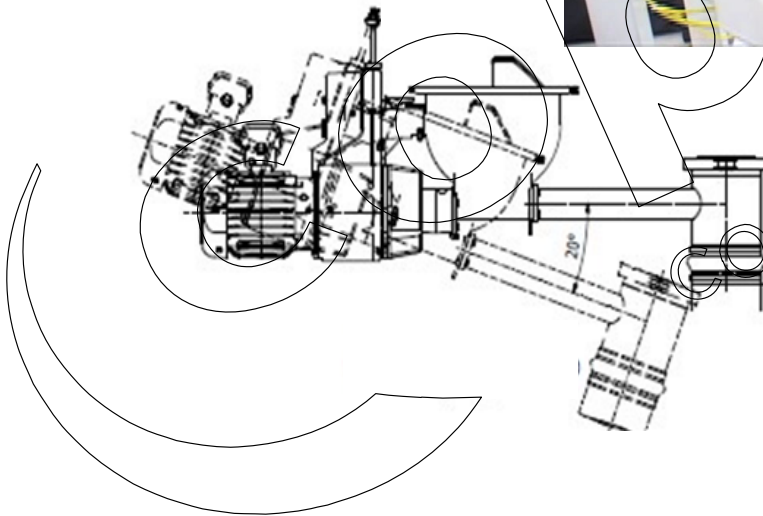


Technology

The Package Of Versatility – Reducing No. 2 Hourly Changeover Loss

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Detachable Bowl
(along with agitator)

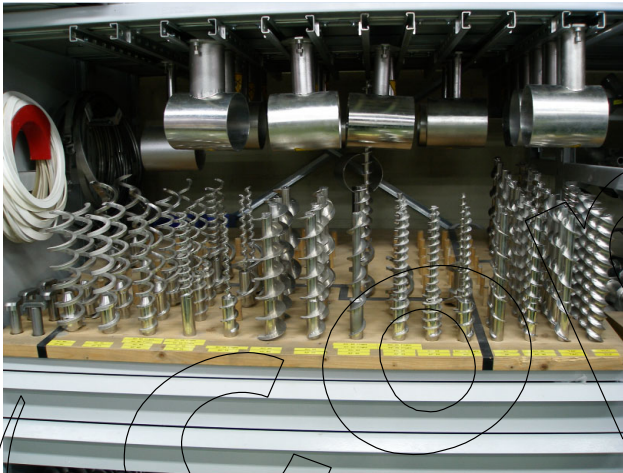


Technology

The Package Of Versatility – Reducing No. 2 Hourly Changeover Loss



Detachable screws



Single Spiral

Twin Concave

Single Auger

Twin Auger

Double Auger

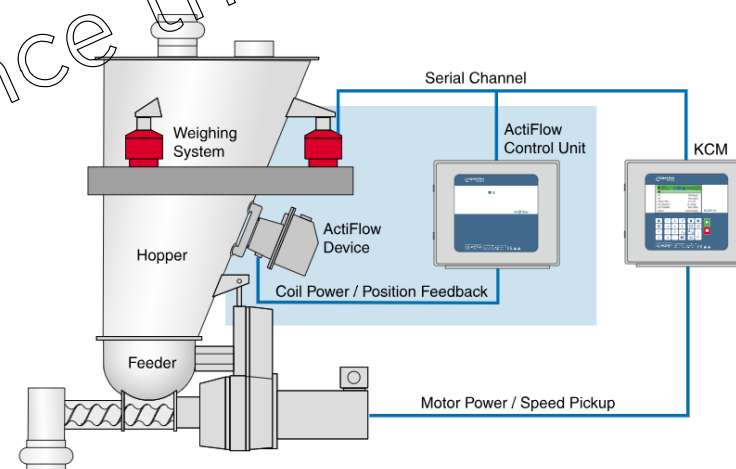
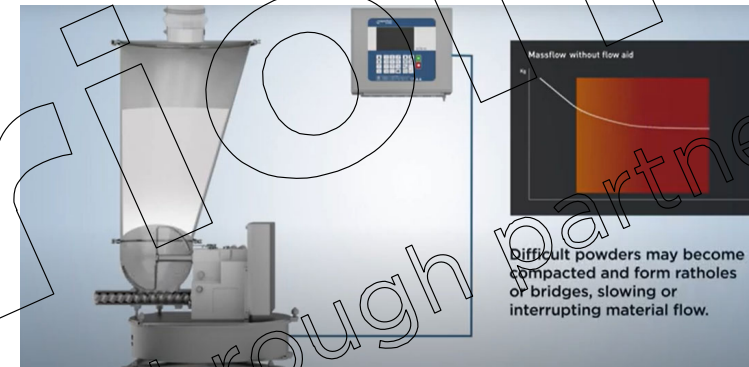
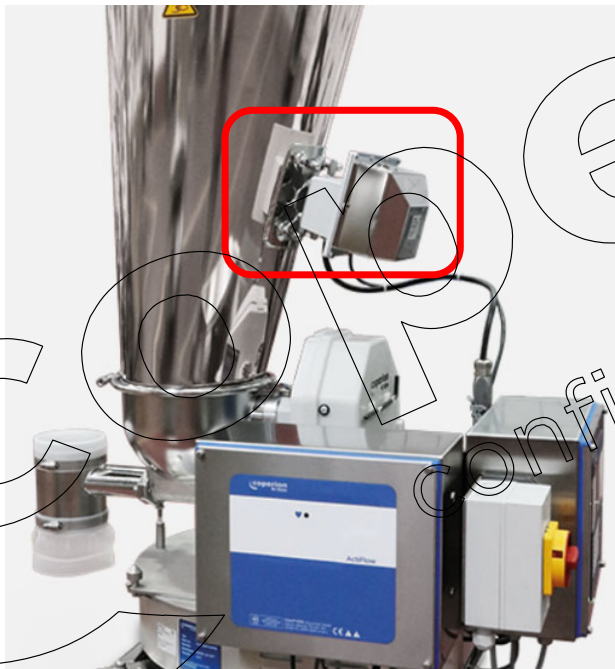


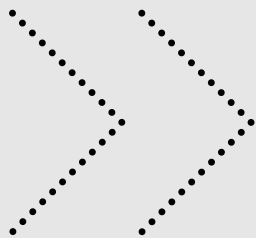
Technology

The Package Of Versatility – Reducing No. 2 Hourly Changeover Loss



Actiflow



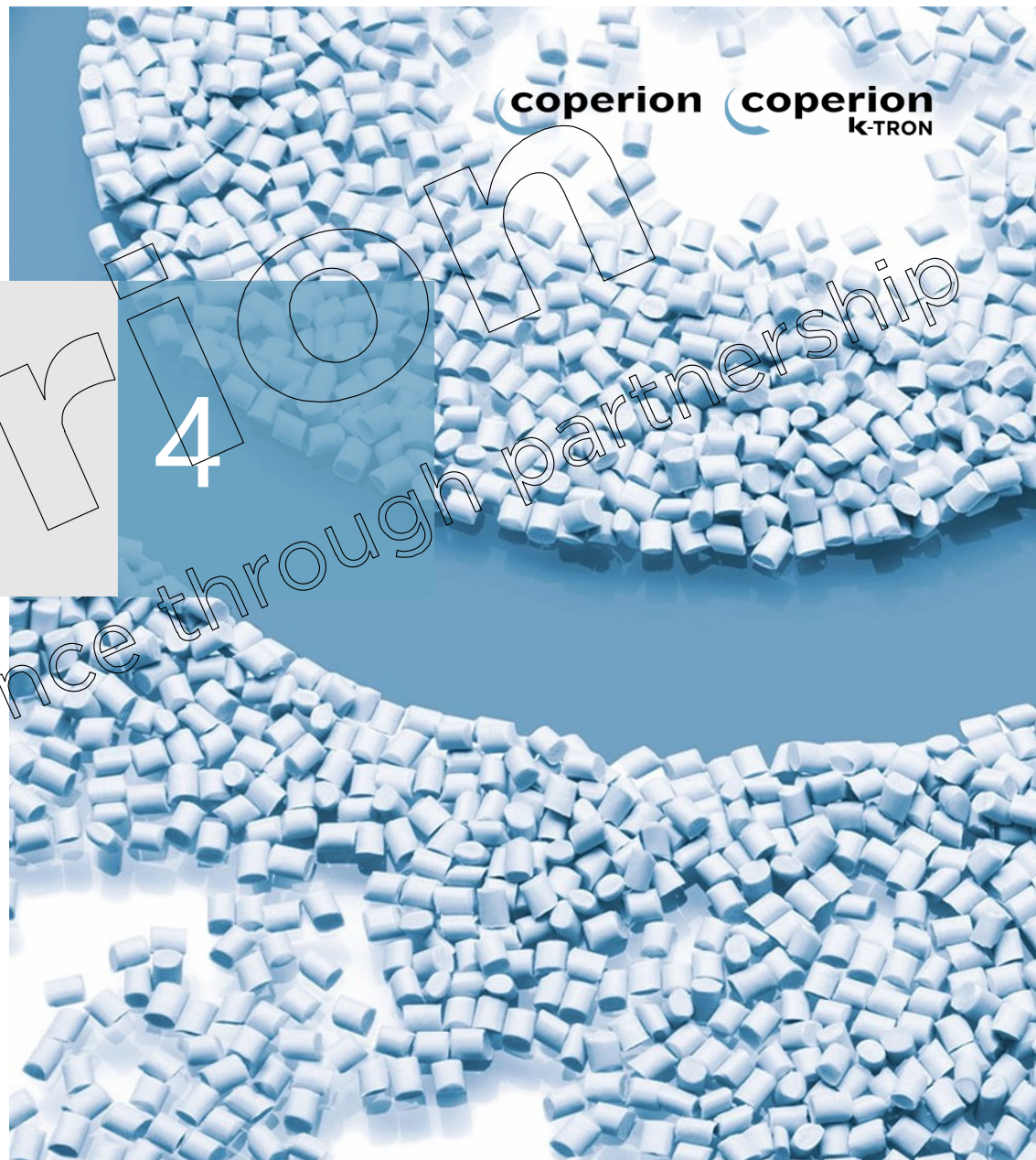
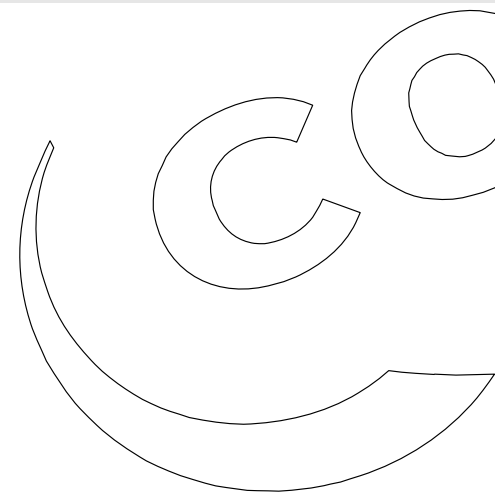


Feeder Variety Showcase

4

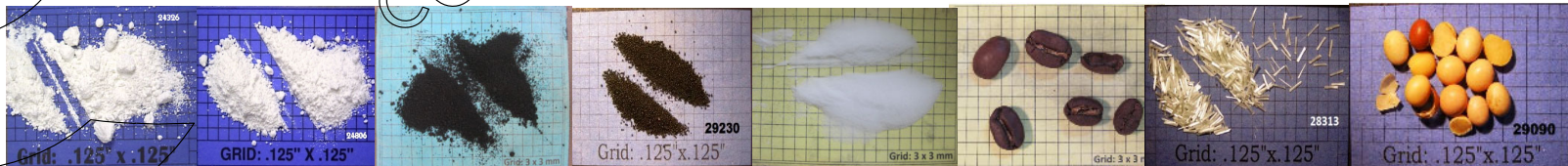
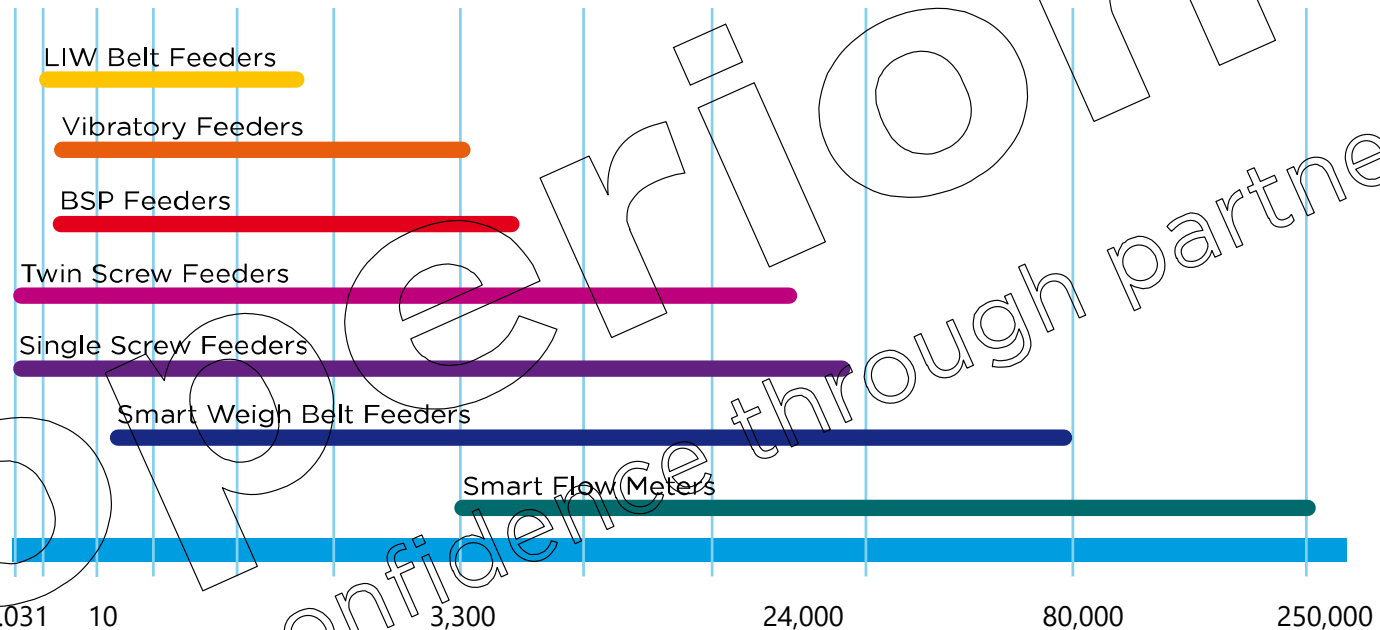
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Feeder Variety Showcase

Range of Products



Feeder Variety Showcase

Vibratory Feeder



To handle fragile, non-uniform,
abrasive materials

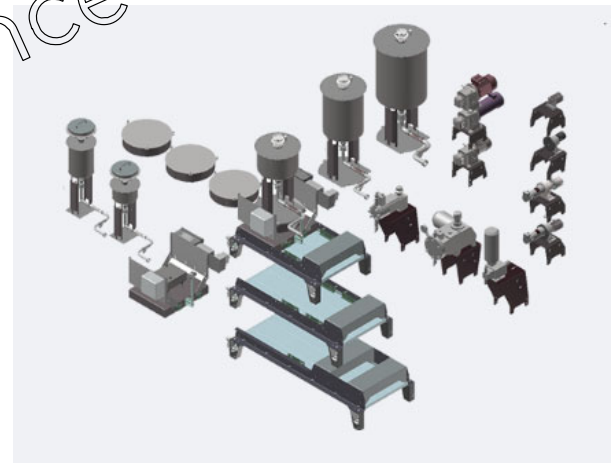
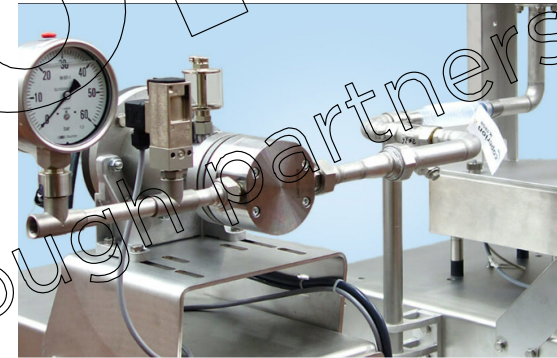
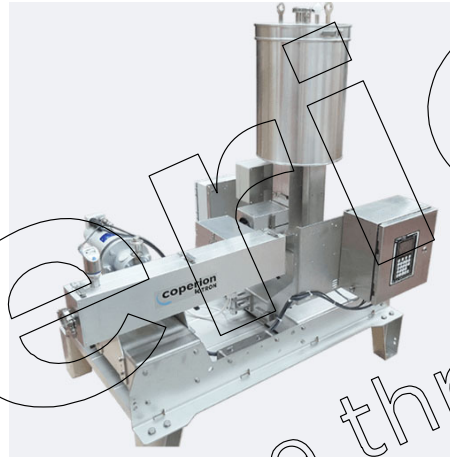
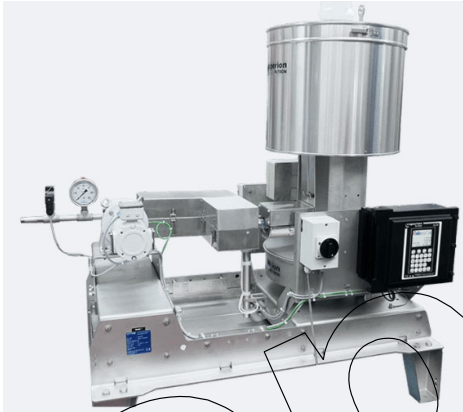
Easy to clean

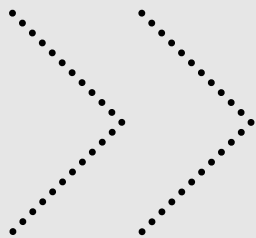
Low energy consumption

Feeder Variety Showcase

Liquid Loss-In-Weight Feeder

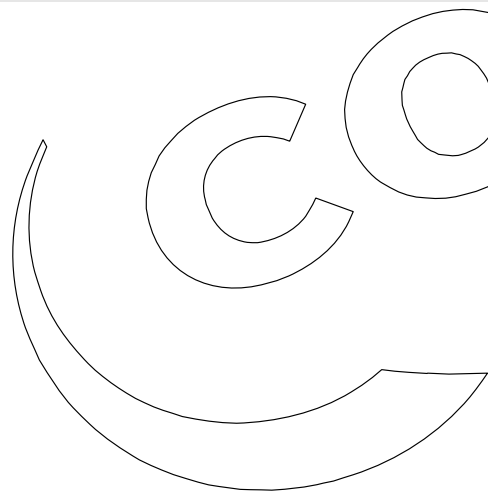
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Smart Controllers

5



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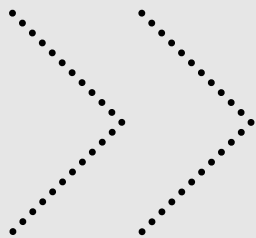
confidence through partnership

Smart Controllers

KCM / K-Vision

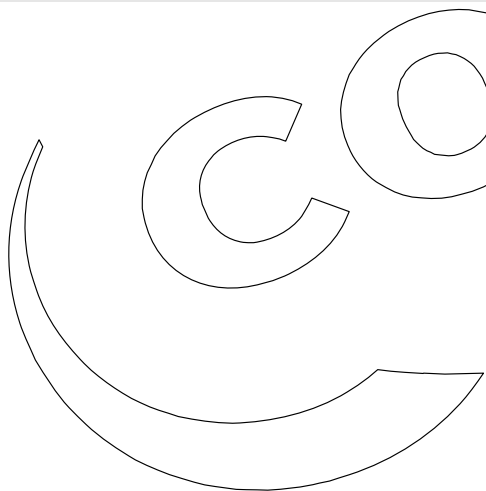
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Refill Systems

6



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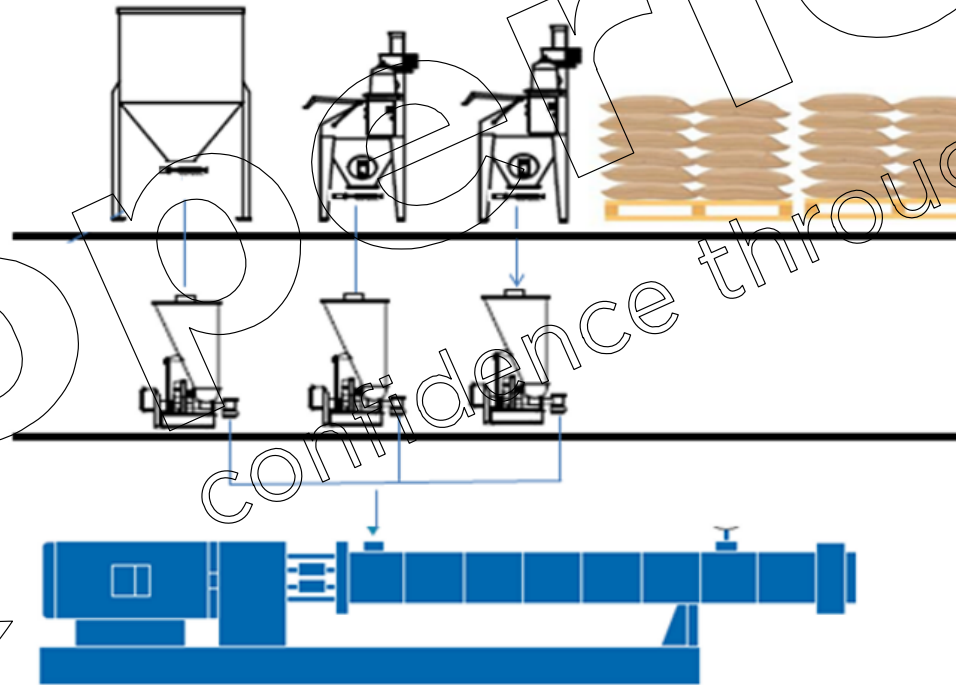
confidence through partnership

Refill Systems

Introduction



Height, Space, Load Bearing, Safety?



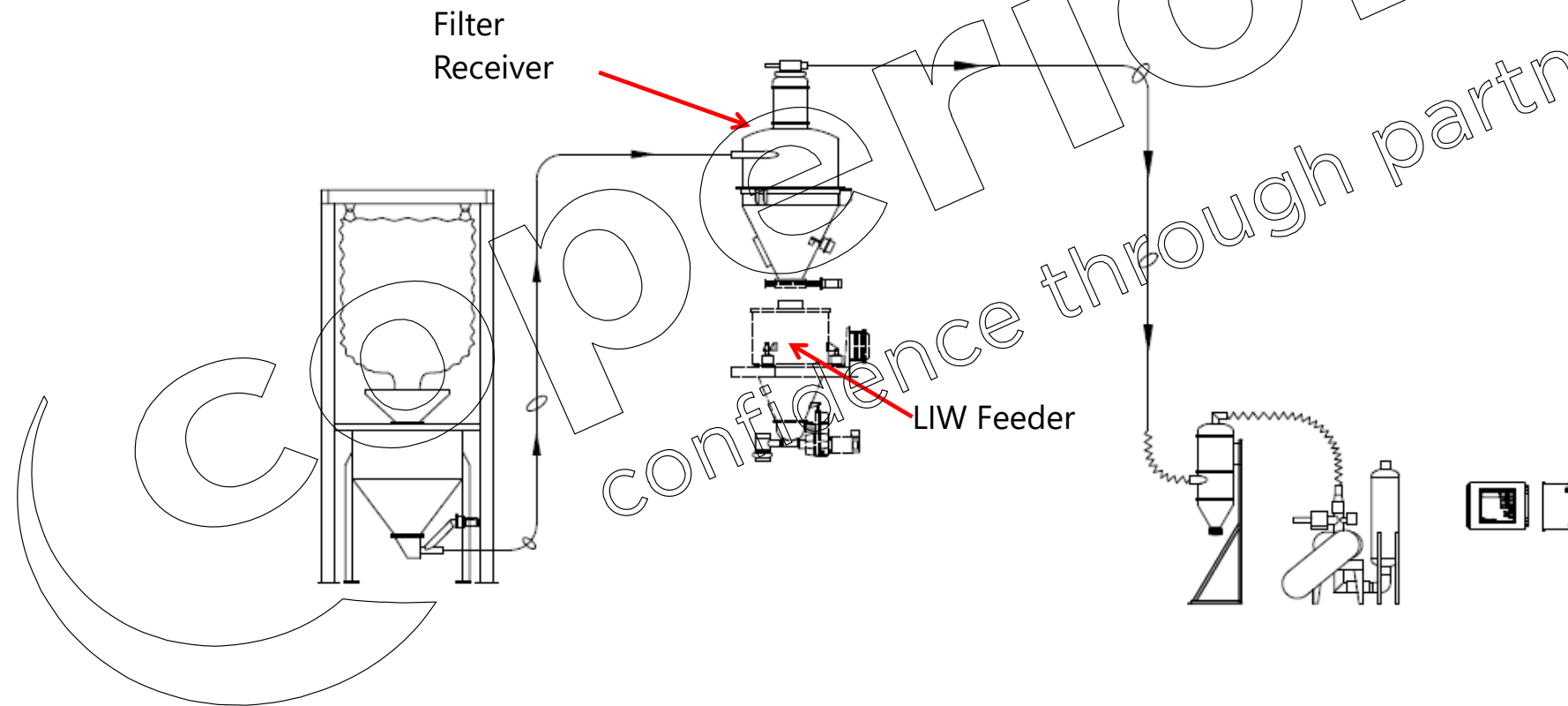
Refill Systems

Direct Refill

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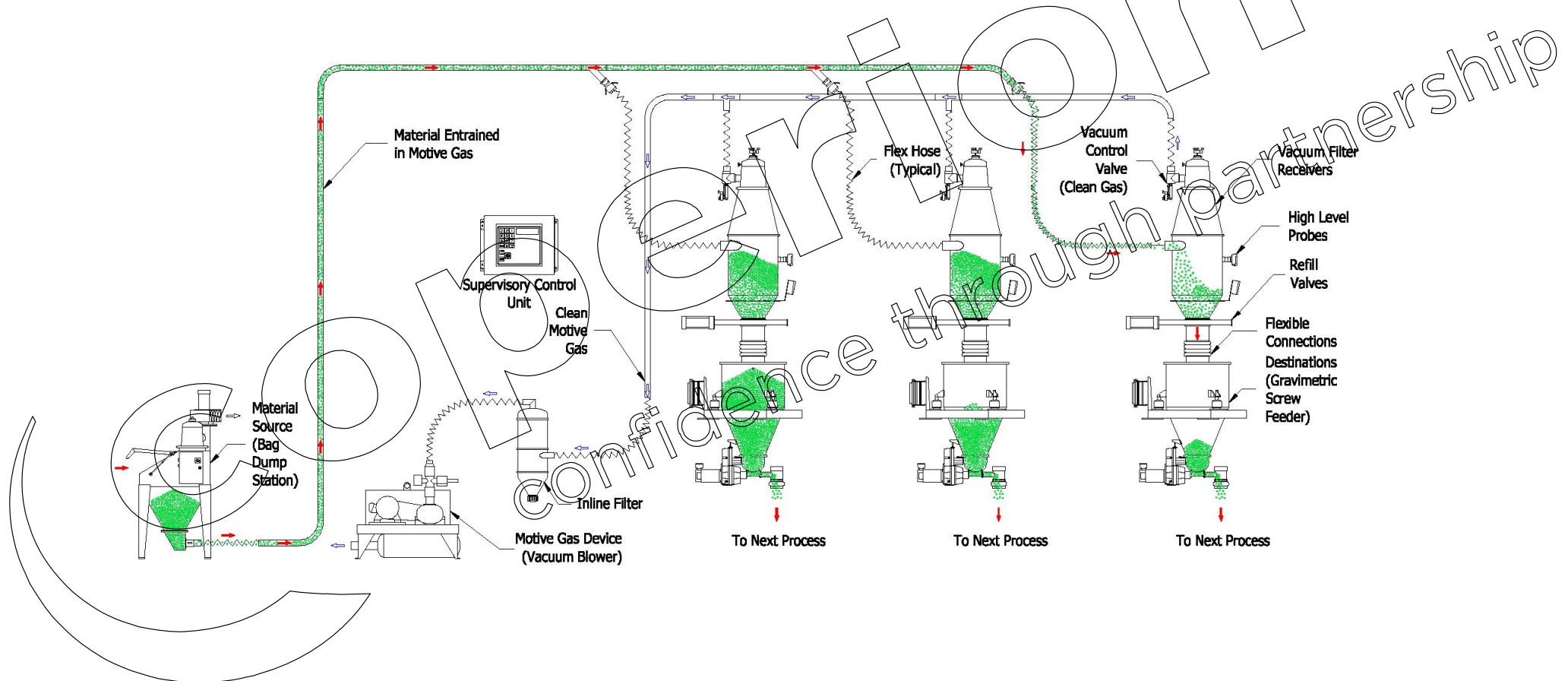
Filter
Receiver

LIW Feeder



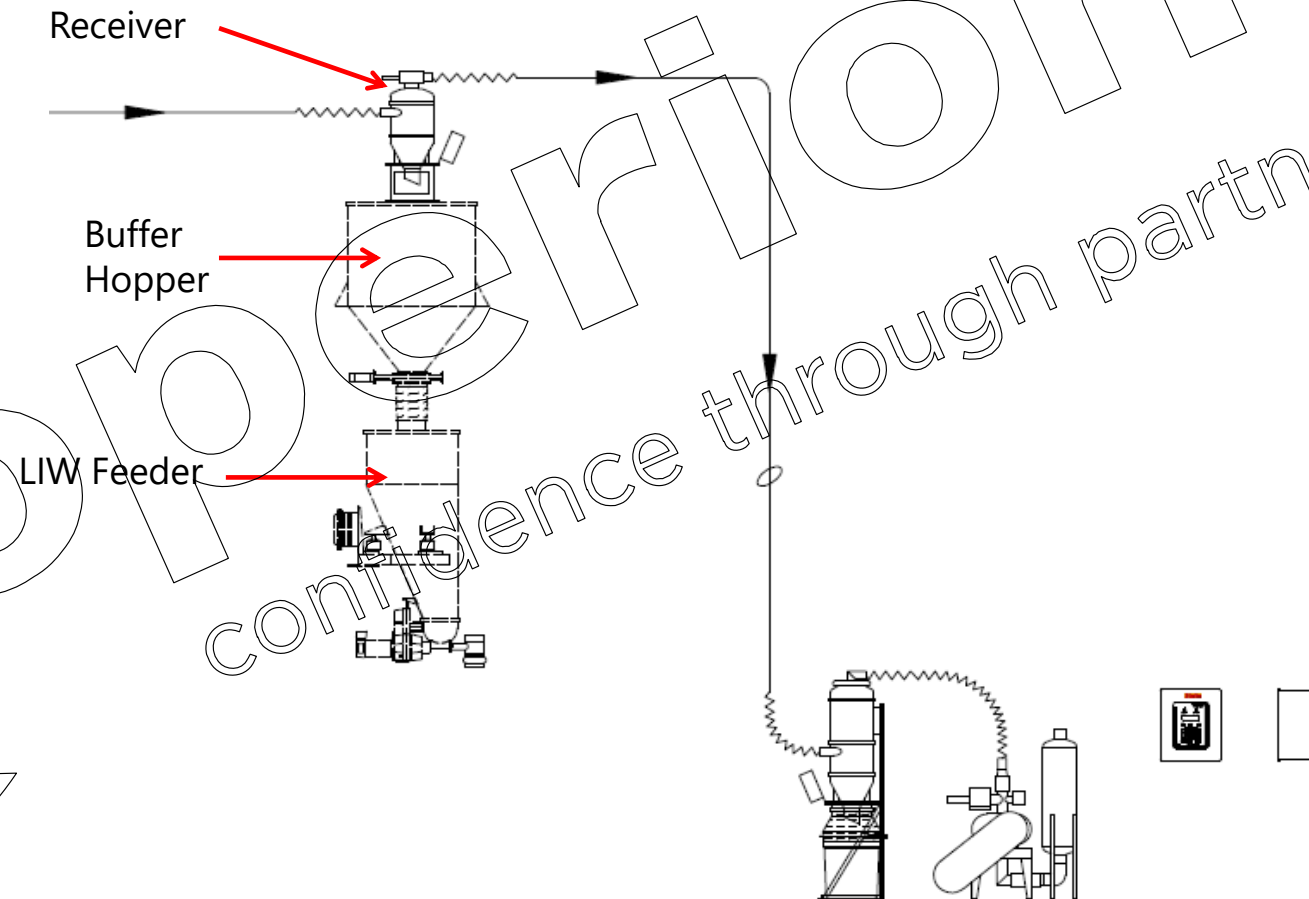
Refill Systems

Sequencing Refills



Refill Systems

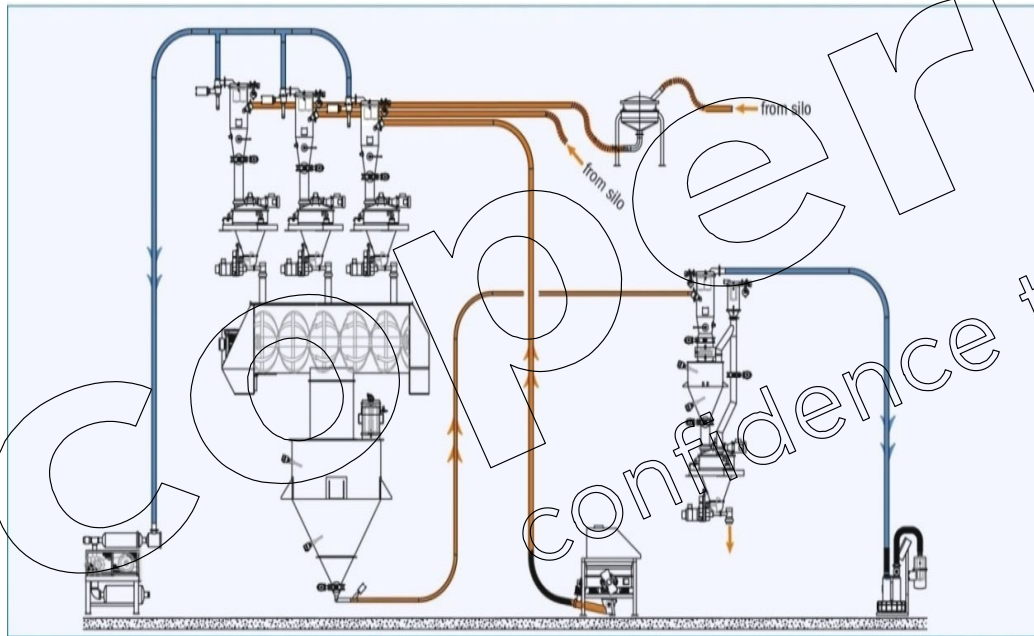
Refill With Buffer Hopper

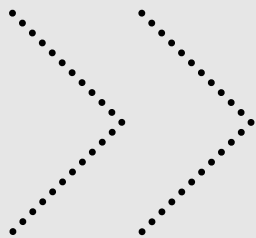


Refill Systems

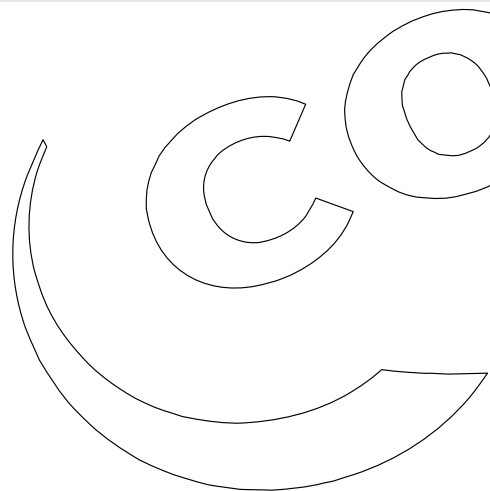
Sample Diagram And Photo

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K-TRON

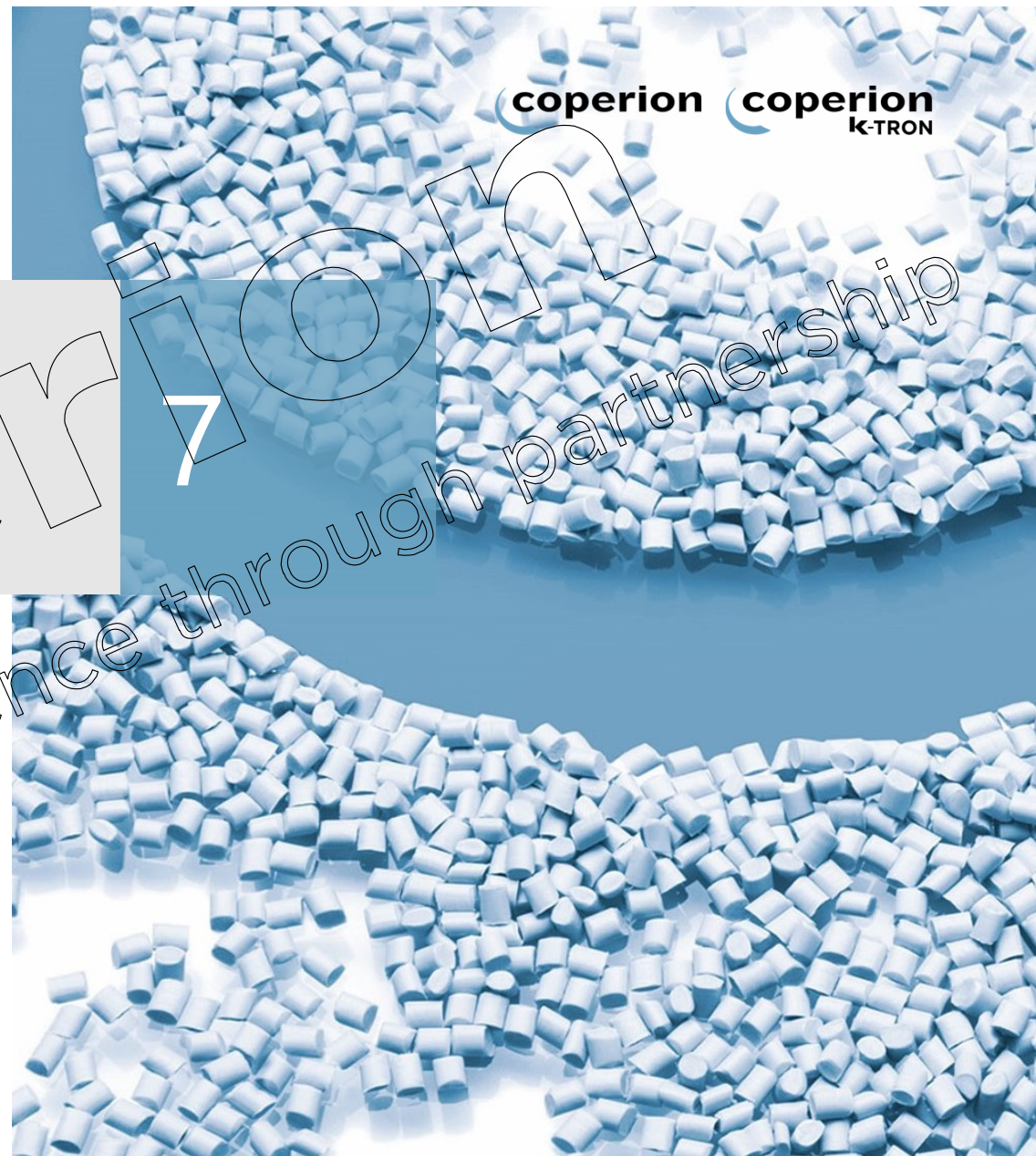




Takeaway



Engineering Plastic Seminar 2024



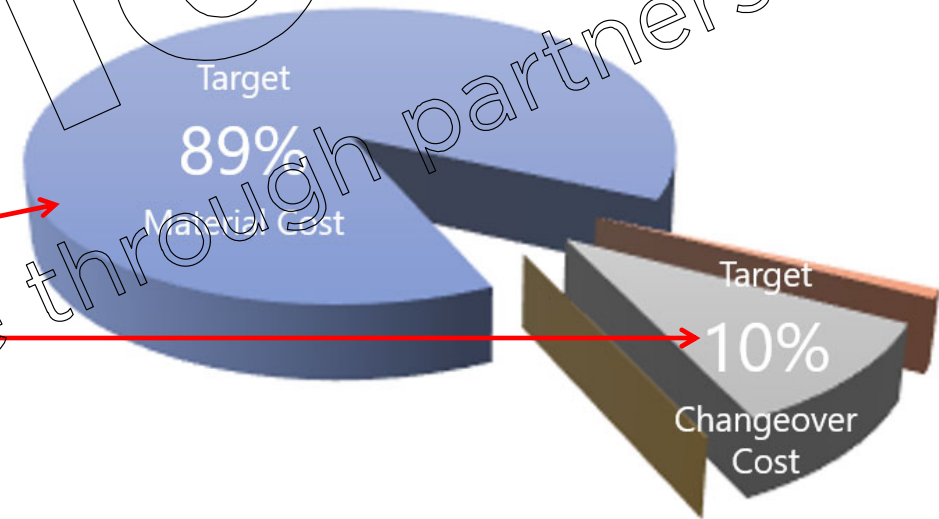
Takeaway

Use Feedsmart Recipe Optimizer to **save a lot** of money

Use high accuracy feeders to **save a lot MORE** money

Supported by top-notch **technology** and **versatility**

Backed with **smart controllers**: ease of use, great functionalities and connectivity.



This is why:

Precise Feeding Saves a lot of Money



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Thank you
very much for
your attention.

You're very welcome to follow us.

