



Advanced characterization of an rPET flow

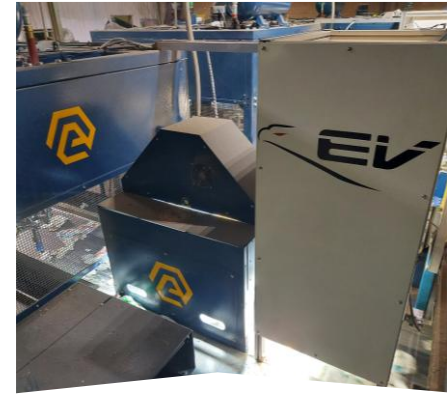
Nathanael Lortie, Eagle Vizion President



Eagle Vizion: Specialist in hyperspectral technology

Canadian company founded in 2006,
started with the following markets

- MRF & Recyclers
- Removal of PET Bottles with sleeves



In 2012, EV diversified:

- Conveyor Audit scanner
- SWIR & A.I. sorters
- Flake Sorters (for 50/50 mix)
- Flake Analyzer



The Flake Analyzer

➤ The Flake Analyzer in details

Features	Value
Analysis width	101 mm
Resolution	0,5 mm/px
Minimum detection size	0,25 mm
Throughput (kg/h)	10-50
Sensor SWIR	Hyperspectral
Color Sensor	RGB Sensor



Flake Analyzer : How it works.

For every flake:

Analysis result

=

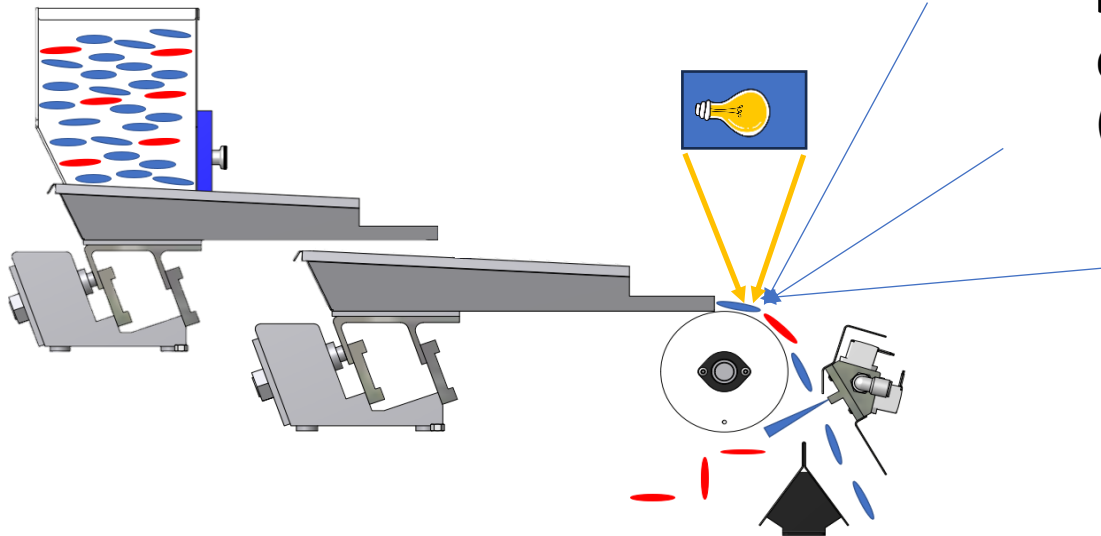
NIR Analysis
(Material type)

+

Color Analysis
(Segmentation)

+

AI image analysis
(Visual Aspects)

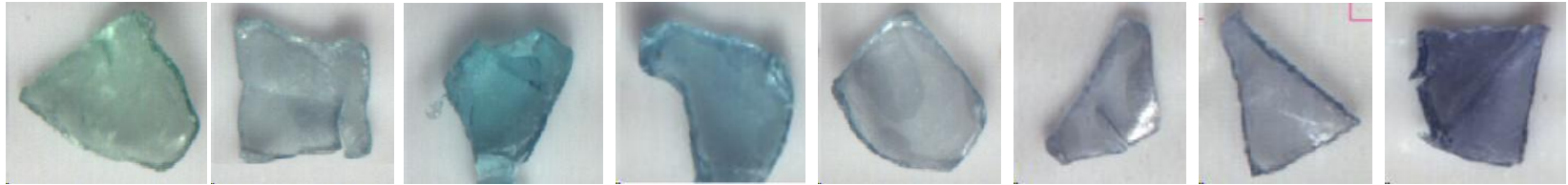


Flake Analyzer : Identification steps

Technology steps					Final Result	
SWIR	Color	A.I.				
	+		+		=	
PET	Green	Green Opaque			PET Green Opaque	
Individual steps and results						

Flake Analyzer : Identification steps

Where does green and blue start? Each customer & markets has it's own color spec requirements. The FA can be adjusted for customer requirements on color.



SWIR

Color

A.I.

Final Result



+



+



=



PET

Blue

Green Opaque

PET **B**leu **R**opaque
Visual aspects tailored to
customer request.

Adaptive part for
each client

Flake Analyzer : Adaptation to each client

Blue or Green?
Opaque or clear?



Opaque gray with
opaque colors or with
opaque whites?



Dark blue or
light blue?

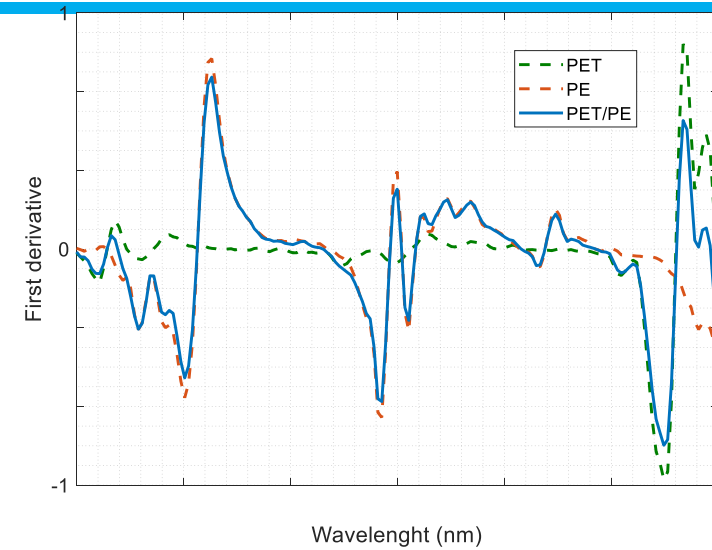
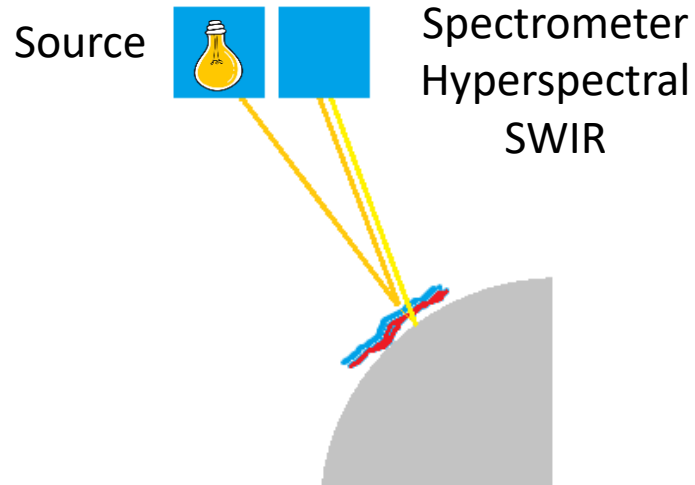


Multi-layers and milk
bottle liner?



Although having a standard, the categories and results of FA can be adapted to the needs of the client.

Detection in reflection & transmission



Hyperspectral detection of material:

- Reflection & Transmission
- Superposition of spectrum
- Identification of complex materials
 - ✓ Coextruded
 - ✓ Multi-layered

Scalable technology :

- Creation of new category based on the arrival of new products

Detailed analysis report

Product	3i	PPM	Product	3i	PPM	Product	3i	PPM
PVC		672	Glass		13	PETClear		730381
PLA		567	Wood		744	PETMilky		24831
PS		136	PA		301	PETGreen		19028
PP		571	PETPP		8875	PETBlueC		18385
PE		82	PETPS		0	PETBlueD		21259
PETG		2546	PETPVC		83	PETBrown		7063
PC		804	PETPE		4807	PETColor		%
Black		5826	POM		825	PETNeck		
Gray		0	PUR		196	PETG-PS		
Silicone		296	ABS		332	PETEL		
PMMA		527	PC-ABS		0	Label		
PETUnknown		7255	MXD6		455	AI_Other		
Unknown		143	WhiteOpaque		59252			
Rubber		63	GrayOpaque		844			
Metal		5294	ColorOpaque		24542			

Color

NIR

Color + NIR

Load: 0.00 %

Ejected: 0.00 %

Y000173540

%

3i

Main page

Statistics

Delt

Detections

Maintenance

3i

Calibration

File transfer

Granulometer

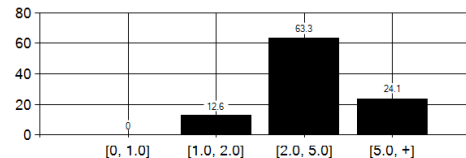
EAGLE VIZION

Status

- Run
- Internal com
- External com
- Valves
- Calibration
- MCR
- Emergency stop

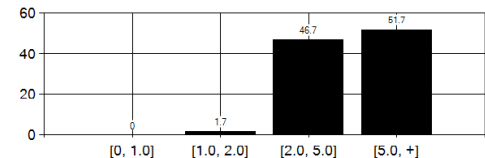
SWIR detailed detection

Percentage of particles



Qty of particles : 100.0% Qty of ignored particles : 0.0%

Percentage of surfaces

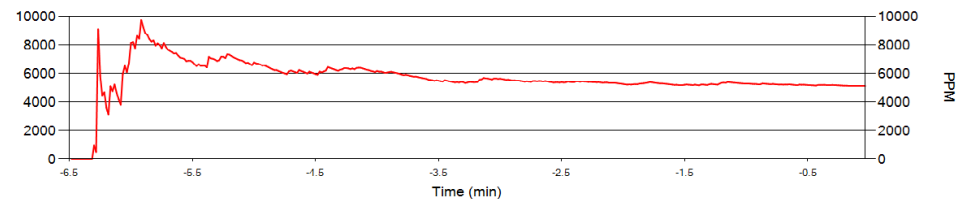


Qty of surfaces : 100.0% Qty of ignored surfaces : 0.0%

Images of last particles detected (PVC)



5121 PPM



Close

Auto Save Images

EAGLE VIZION

Detailed analysis report

Product	3i	PPM	Product	3i	PPM	Product	3i	PPM
PVC		672	Glass		13	PETClear		730381
PLA		567	Wood		744	PETMilky		24831
PS		136	PA		301	PETGreen		19028
PP		571	PETPP		8875	PETBlueC		18385
PE		82	PETPS		0	PETBlueD		%
PETG		2546	PETPVC		83	PETBrown		
PC		804	PETPE		4807	PETColor		
Black		5826	POM		825	PETNeck		
Gray		0	PUR		196	PETG-PS		
Silicone		296	ABS		332	PET EL		
PMMA		527	PC-ABS		0	Label		
PETUnknown		7255	MXD6		455	AI_Other		
Unknown		143	WhiteOpaque		59252			
Rubber		63	GrayOpaque		844			
Metal		5294	ColorOpaque		24542			

Color

NIR

Color + NIR

Load: 0.00 %

Ejected: 0.00 %

PPM

Y000173540

%

3i

Main page

Statistics

Delt

Detections

Maintenance

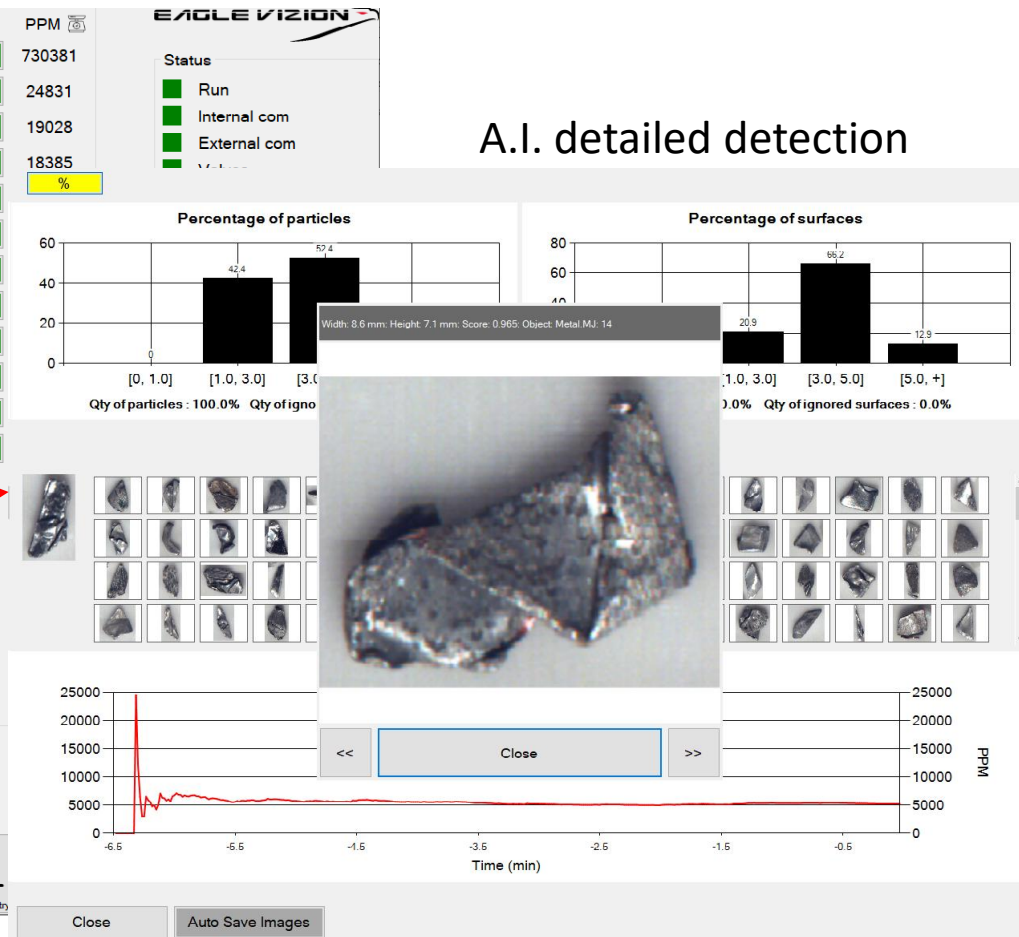
3i

Calibration

File transfer

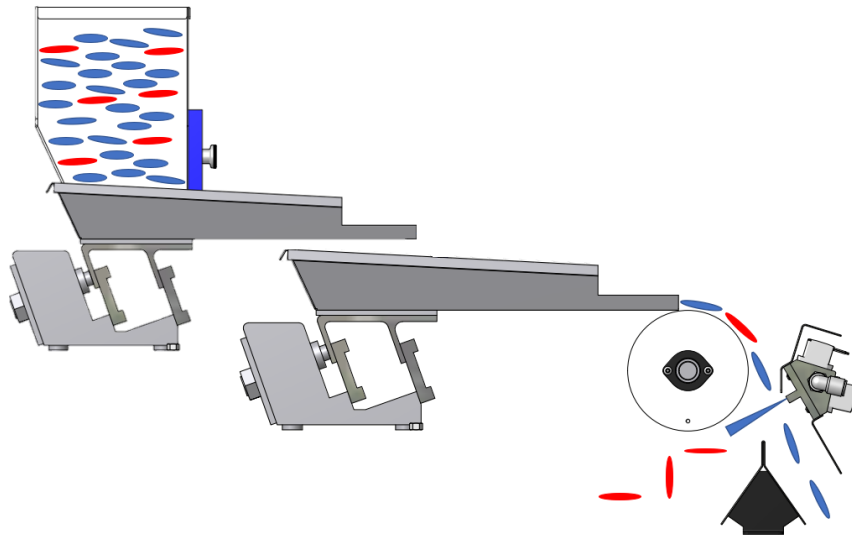
Granulometry

A.I. detailed detection



A non-destructive analysis method

- Ejection of the desired contaminant
- Understanding the origin
- Additional teaching/testing



After the oven test



Ejected by the FA



Clear and precise analysis report

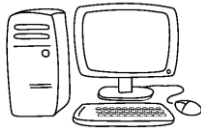
The machine is used to produce laboratory sample quality reports.

Flake Analyzer screen



- Grade of the sample (A, B, C, D) + the material(s) which caused the change in grade.
- Data backup (CSV and Excel reports).

Other computer



- Storage of test reports
- Query SQL database
- Statistical tool



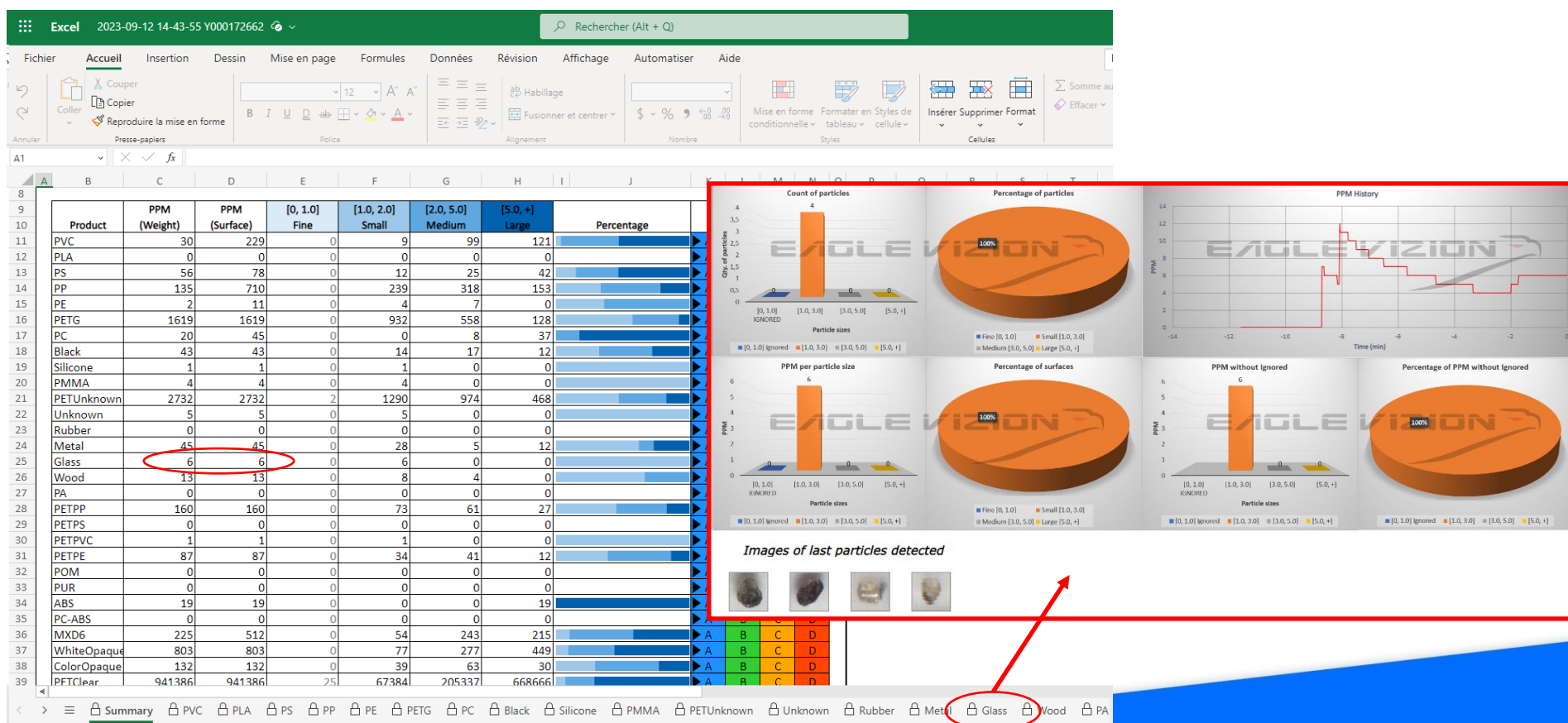
Sample

Clean
Sample

Ejected
Contaminants

Clear and precise analysis report (EXCEL format)

➤ Generating an EXCEL report



Clear and precise analysis report(CSV format)

- Generation of a CSV report (by sample and overall).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Load	Min	0.003	Max	19.893	Average	9.914										
2	Data	User	PVC	PLA	PS	PP	PE	PETG	PC	Black	Silicone	PMMA	PETUnknov	Unknown	Rubber	Metal	Glass
3	Counts	EagleVizio	1944	0	665	6039	93	13768	381	364	5	36	23234	39	0	382	52
4	PPM	EagleVizio	229	0	78	710	11	1619	45	43	1	4	2732	5	0	45	6
5	WeightedPPM	EagleVizio	30	0	56	135	2	1619	20	43	1	4	2732	5	0	45	6
6	Total	EagleVizio	33	0	11	204	4	769	3	11	1	5	1092	7	0	15	4
7	OK	EagleVizio	33	0	11	204	4	769	3	11	1	5	1086	7	0	15	4
8	Ignored	EagleVizio	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0
9	Range 1	EagleVizio	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0
10	Range 1 PPM	EagleVizio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Range 2	EagleVizio	10	0	5	147	3	676	0	7	1	5	910	7	0	13	4
12	Range 2 PPM	EagleVizio	9	0	12	239	4	932	0	14	1	4	1290	5	0	28	6
13	Range 3	EagleVizio	17	0	4	47	1	84	1	3	0	0	147	0	0	1	0
14	Range 3 PPM	EagleVizio	99	0	25	318	7	558	8	17	0	0	974	0	0	5	0
15	Range 4	EagleVizio	6	0	2	10	0	9	2	1	0	0	29	0	0	1	0
16	Range 4 PPM	EagleVizio	121	0	42	153	0	128	37	12	0	0	468	0	0	12	0
17																	

K2556																	
2528	Y0001740	WeightedF	EagleVizio	7	16	34	8	0	384	3							
2527	Y0001740	Total	EagleVizio	12	2	7	20	1	203	1							
2528	Y0001740	OK	EagleVizio	12	2	7	20	1	203	1							
2529	Y0001740	Ignored	EagleVizio	0	0	0	0	0	0	0							
2530	Y0001740	Range 1	EagleVizio	0	0	0	0	0	0	0							
2531	Y0001740	Range 1P	EagleVizio	0	0	0	0	0	0	0							
2532	Y0001740	Range 2	EagleVizio	3	1	4	17	1	175	2							
2533	Y0001740	Range 2P	EagleVizio	2	1	2	24	2	187	4							
2534	Y0001740	Range 3	EagleVizio	9	0	0	3	0	24	6							
2535	Y0001740	Range 3P	EagleVizio	51	0	0	17	0	137	38							
2536	Y0001740	Range 4	EagleVizio	0	1	3	0	0	4	2							
2537	Y0001740	Range 4P	EagleVizio	0	16	45	0	0	60	35							
2538																	
2539	2023-09-19 16-13-25																
2540	Load	Min	0.003	Max	20.563	Average	5.440										
2541	File	Data	User	PVC	PLA	PS	PP	PE	PETG	PC							
2542	Y0001742	Counts	EagleVizio	685	203	0	1137	44	4100	60							
2543	Y0001742	PPM	EagleVizio	72	21	0	120	5	432	6							
2544	Y0001742	WeightedF	EagleVizio	9	21	0	23	1	433	2							
2545	Y0001742	Total	EagleVizio	13	3	0	46	3	212	1							
2546	Y0001742	OK	EagleVizio	13	3	0	46	3	212	1							
2547	Y0001742	Ignored	EagleVizio	0	0	0	0	0	0	0							
2548	Y0001742	Range 1	EagleVizio	0	0	0	0	0	0	0							
2549	Y0001742	Range 1P	EagleVizio	0	0	0	0	0	0	0							
2550	Y0001742	Range 2	EagleVizio	2	2	0	35	3	179	2							
2551	Y0001742	Range 2P	EagleVizio	1	3	0	53	5	215	5							
2552	Y0001742	Range 3	EagleVizio	9	0	0	11	0	31	2							
2553	Y0001742	Range 3P	EagleVizio	39	0	0	67	0	185	1							
2554	Y0001742	Range 4	EagleVizio	2	1	0	0	0	2	1							
2555	Y0001742	Range 4P	EagleVizio	32	18	0	0	0	32	4							
2556																	
2557	2023-09-19 16-29-35																
2558	Load	Min	0.003	Max	22.333	Average	3.838										
2559	File	Data	User	PVC	PLA	PS	PP	PE	PETG	PC							
2560	Y0001742	Counts	EagleVizio	535	96	0	753	0	4343	39							
2561	Y0001742	PPM	EagleVizio	56	10	0	79	0	455	4							
2562	Y0001742	WeightedF	EagleVizio	7	10	0	15	0	455	1							
2563	Y0001742	Total	EagleVizio	11	3	0	35	0	234	5							
2564	Y0001742	OK	EagleVizio	11	3	0	35	0	234	5							
2565	Y0001742	Ignored	EagleVizio	0	0	0	0	0	0	0							

Clear and precise analysis report (SQL base)

- Internal machine database usable by the customer

Eagle Vizion - Color + Flake Analyzer 2023a [4.0.0.33]

Identification

Server IP: 127.0.0.1 ID: admin Machine name: fa

Database: ev Password: AAAAAA

Table

Create tables weightedppm Display table Hide table

id	Date	User	Batch	Name	FileName	Recipe	Prod	Grade	Contamina
362	9/6/2023 3:01 PM	EagleVizion		EV PET...	Y000171...	EV PET...		A	
361	9/6/2023 2:30 PM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
360	9/6/2023 1:23 PM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
359	9/6/2023 11:48 AM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
358	9/6/2023 9:41 AM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
357	9/6/2023 9:11 AM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
356	9/5/2023 4:44 PM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
355	9/5/2023 4:11 PM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
354	9/5/2023 3:33 PM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
353	9/5/2023 3:05 PM	EagleVizion		EV PET...	Y000170...	EV PET...		A	
352	9/5/2023 2:50 PM	EagleVizion		EV PET...	Y000170...	EV PET...		A	
351	9/1/2023 4:23 PM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
350	9/1/2023 3:50 PM	EagleVizion		EV PET...	Y000170...	EV PET...		A	
349	9/1/2023 3:29 PM	EagleVizion		EV PET...	Y000170...	EV PET...		A	
348	9/1/2023 3:08 PM	EagleVizion		EV PET...	Y000170...	EV PET...		A	
347	9/1/2023 2:46 PM	EagleVizion		EV PET...	Y000171...	EV PET...		A	
346	9/1/2023 2:18 PM	EagleVizion		EV PET...	Y000171...	EV PET...		A	
345	9/1/2023 1:44 PM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
344	9/1/2023 11:49 AM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
343	9/1/2023 11:17 AM	EagleVizion		EV PET...	Y000170...	EV PET...		A	
342	9/1/2023 9:20 AM	EagleVizion		EV PET...	Y000170...	EV PET...		A	
341	8/31/2023 4:50 PM	EagleVizion		EV PET...	Y000170...	EV PET...		A	
340	8/31/2023 4:23 PM	EagleVizion		EV PET...	Y000172...	EV PET...		A	
339	8/31/2023 11:13 AM	EagleVizion		EV PET...	Y000170...	EV PET...		A	
338	8/31/2023 10:42 AM	EagleVizion		EV PET...	Y000169...	EV PET...		A	
337									

Transfert GradePPM Feeder Stat Valve stat AI Eagle Vizion

Main page Statistics Delt Selections Maintenance 3i Calibration File transfer Granulometry

Users Keyboard Expert

Status

- Run
- Internal com
- External com
- Valves
- Calibration
- MCR
- Emerg. stop
- Light
- Pressure
- Jam
- Antistatic
- Roller

Grade A

Contaminants

Clear and precise analysis report

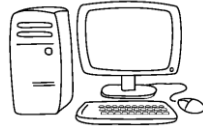
The machine is used to certify quality on a production line.

Flake Analyzer screen



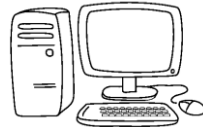
- Rank display every minute
- Displaying PPM

Other computer



- Data consultation
- Remote machine control
- Send a report every minute

I/O control



- Action on production in real time



Continuous
production

Return of flow
in production

Ejected
Contaminants

Installation on the production line: 4.0 ready

Characterization of production in real time.

- Understanding the process
- Drastically increases sampling. A must-have for quantifying production at 10PPM and less.
- High responsiveness in the event of production drift (PLC connection)
- Production traceability (SQL connection)
- Interaction with administrative tools without human intervention (SAP)

