



# POTENTIAL AND IMPACT OF SENSOR BASED SORTING ON THE GRINDING CIRCUIT PERFORMANCE FOR A POLYMETALLIC ORE

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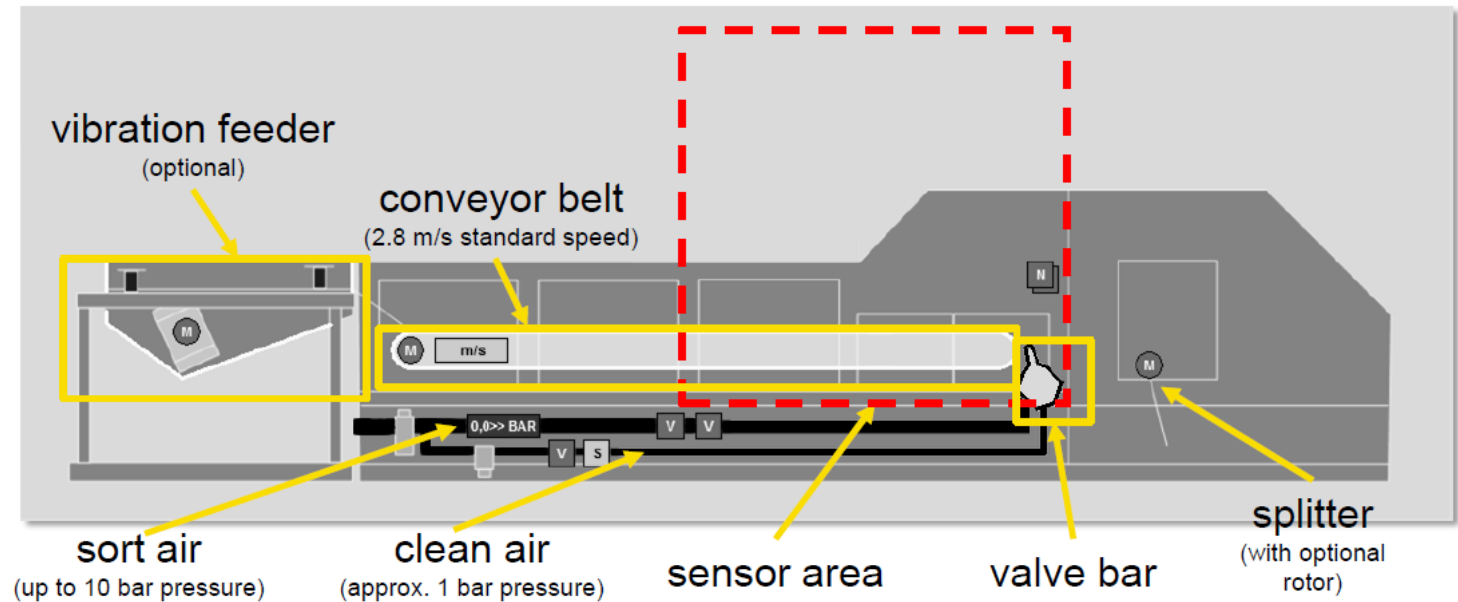
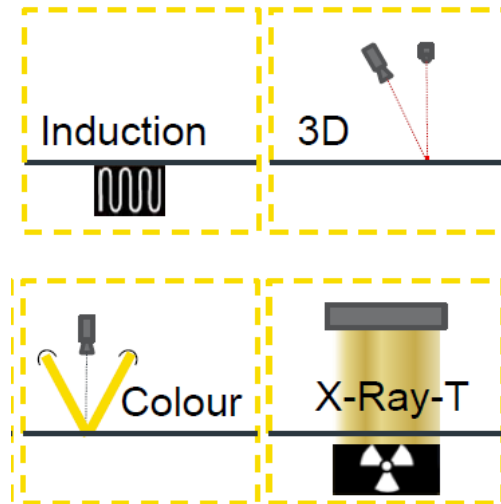
**STEINERT**   
**STEINERT KSS**



# INTRODUCTION

# INTRODUCTION

The presented sorting equipment (KSS CLI) utilizes a combination of **X-ray transmission, 3D recognition, Induction sensor and Colour Camera.**





**OBJECTIVE**

## / OBJECTIVE

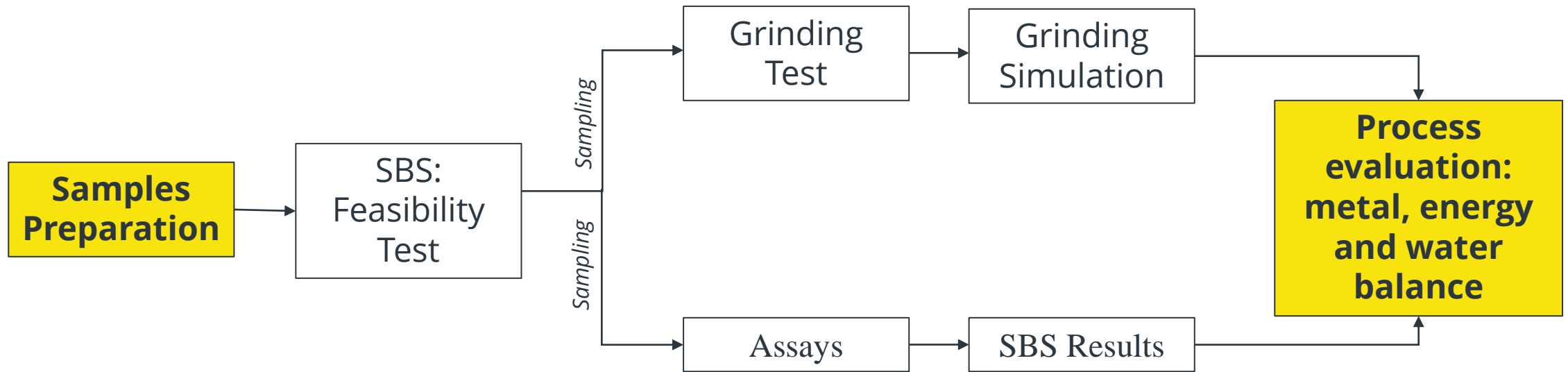
- Provide an integrated evaluation for the understanding of SBS effect in a SABC circuit;
- Calculate the effect of SBS on the energy, water and waste generation for the Aripuanã Project.





# METHODOLOGY

# / METHODOLOGY





# CASE STUDY: ARIPUANĂ PROJECT



# / SBS Results

- In total, 20t of material were tested at different test setup.



**XRT + 3D LASER:**  
Inclusions + High density

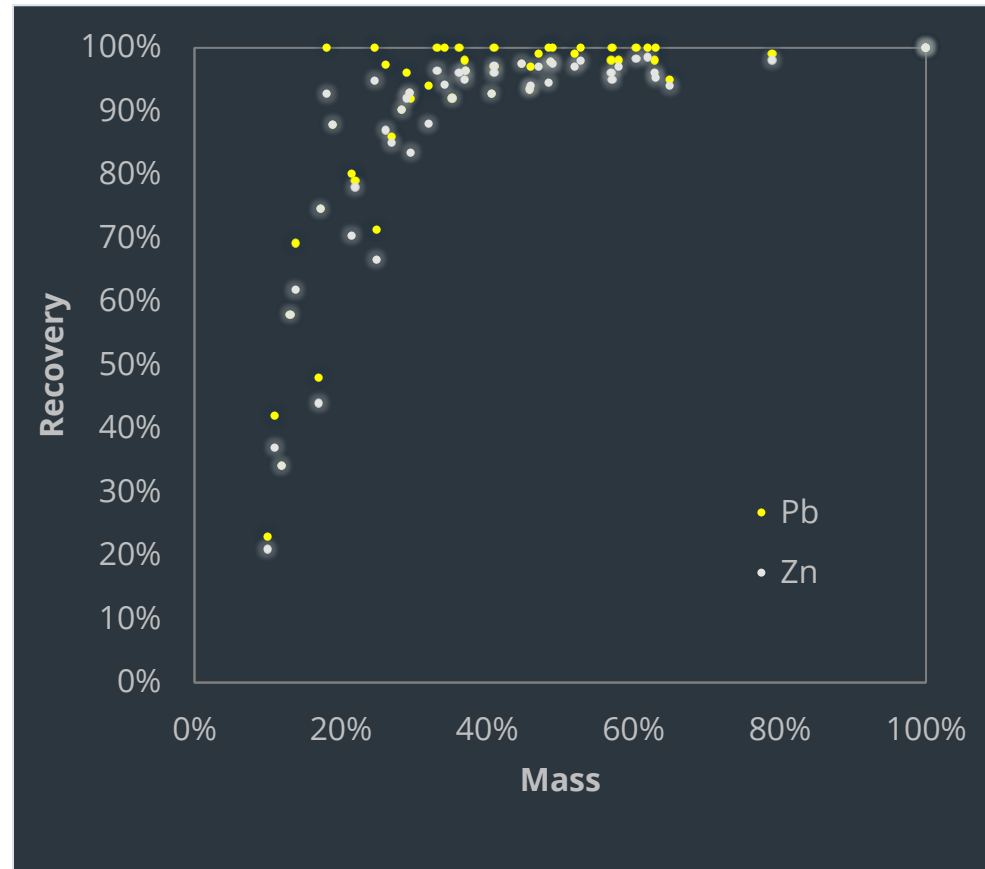


**INDUCTION:**  
Pyrrhotyite + Chalcopyrite



**XRT:**  
Low density

# SBS RESULTS



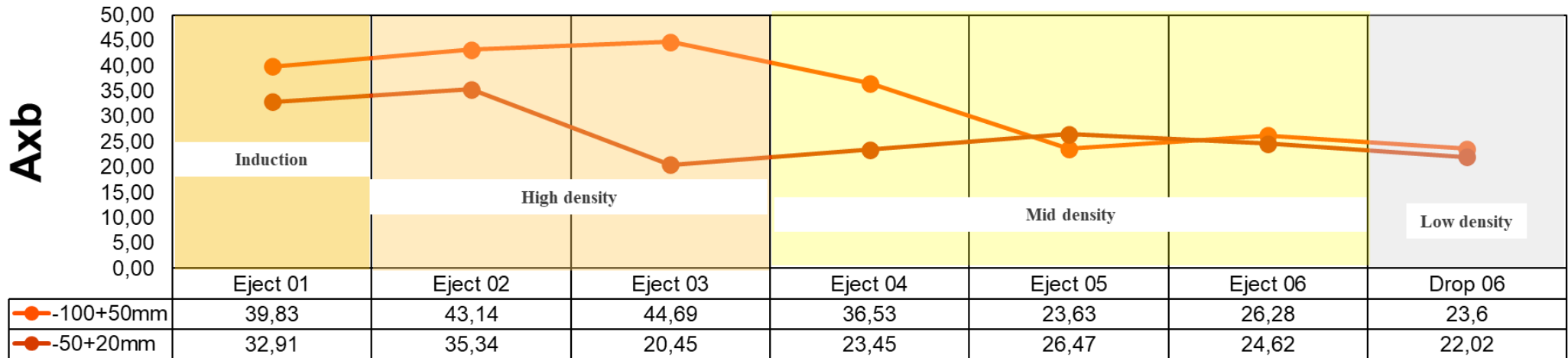
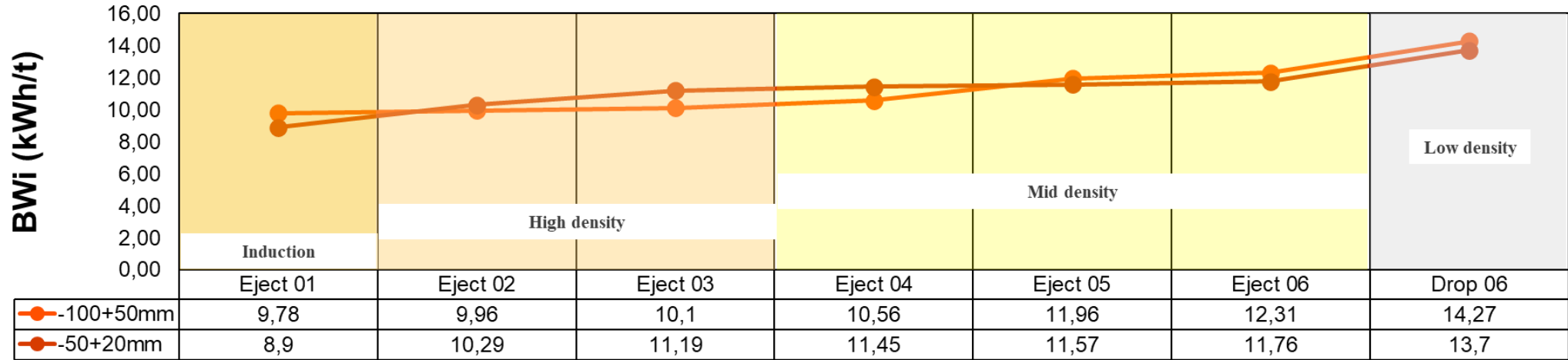
Feed property	Min	Max
Pb (%)	0,26	1,83
Zn (%)	0,95	3,81
Size (mm)	20	150

# / CASE STUDY: SCENARIOS

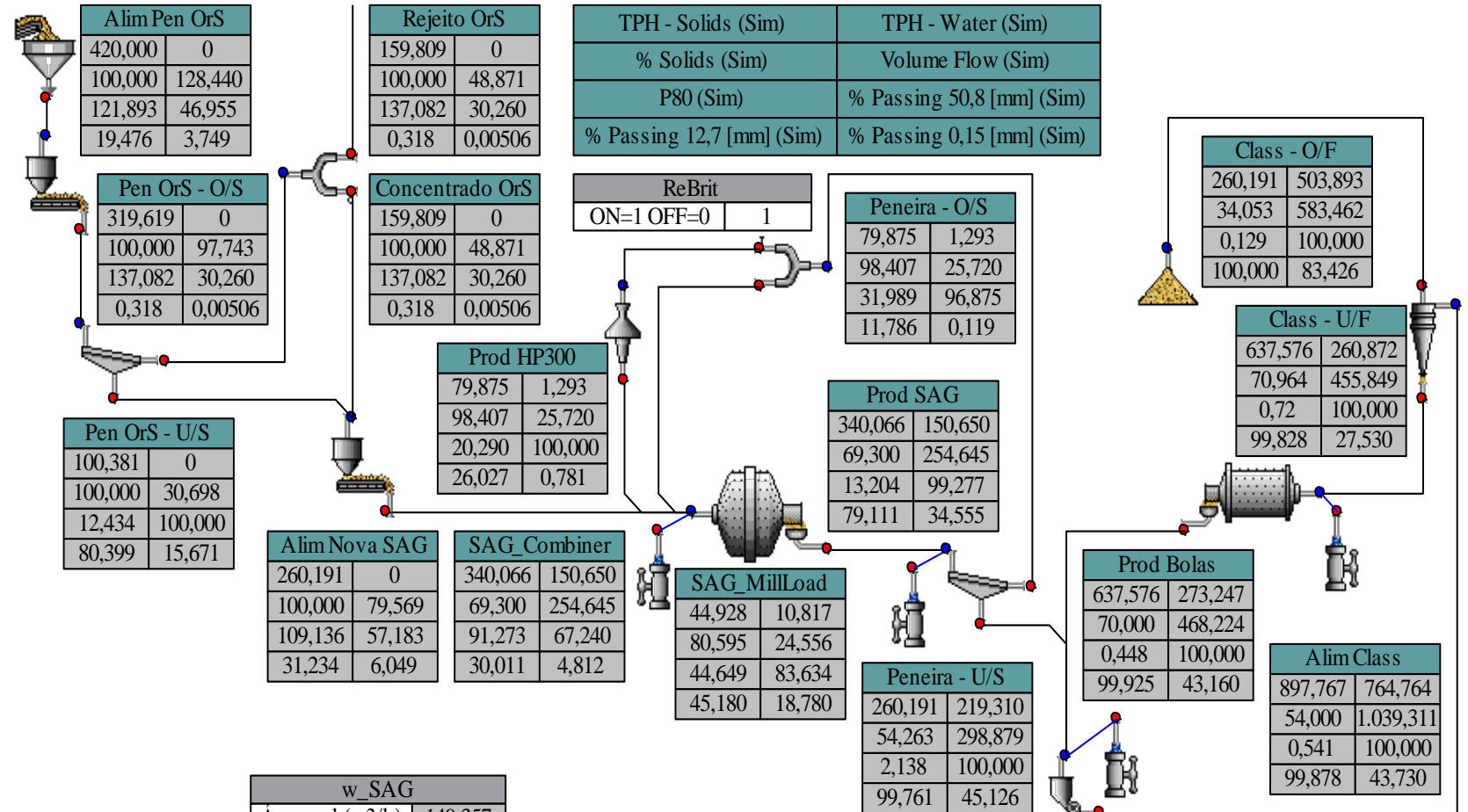
Scenario	Size fraction for SBS	% of feed material for SBS	SBS: mass recovery	% of ROM for the beneficiation plant	SBS capacity	Sorting power (per unit)
A	-	0%	0%	100%	-	-
B	+20mm	76,20%	50%	62%	115 t/h	315 kW
C	-150+20mm	60,41%	50%	70%	98 t/h	330 kW



# / DWT and BWi



# JKSimMet



Alim Pen OrS	
420,000	0
100,000	128,440
121,893	46,955
19,476	3,749

Rejeito OrS	
159,809	0
100,000	48,871
137,082	30,260
0,318	0,00506

TPH - Solids (Sim)	
% Solids (Sim)	
P80 (Sim)	
% Passing 12,7 [mm] (Sim)	

TPH - Water (Sim)	
Volume Flow (Sim)	
% Passing 50,8 [mm] (Sim)	
% Passing 0,15 [mm] (Sim)	

Pen OrS - O/S	
319,619	0
100,000	97,743
137,082	30,260
0,318	0,00506

Concentrado OrS	
159,809	0
100,000	48,871
137,082	30,260
0,318	0,00506

ReBrit	
ON=1 OFF=0	1

Peneira - O/S	
79,875	1,293
98,407	25,720
31,989	96,875
11,786	0,119

Class - O/F	
260,191	503,893
34,053	583,462
0,129	100,000
100,000	83,426

Pen OrS - U/S	
100,381	0
100,000	30,698
12,434	100,000
80,399	15,671

Prod HP300	
79,875	1,293
98,407	25,720
20,290	100,000
26,027	0,781

Prod SAG	
340,066	150,650
69,300	254,645
13,204	99,277
79,111	34,555

Class - U/F	
637,576	260,872
70,964	455,849
0,72	100,000
99,828	27,530

Alim Nova SAG	
260,191	0
100,000	79,569
109,136	57,183
31,234	6,049

SAG_Combiner	
340,066	150,650
69,300	254,645
91,273	67,240
30,011	4,812

SAG_MillLoad	
44,928	10,817
80,595	24,556
44,649	83,634
45,180	18,780

Peneira - U/S	
260,191	219,310
54,263	298,879
2,138	100,000
99,761	45,126

Prod Bolas	
637,576	273,247
70,000	468,224
0,448	100,000
99,925	43,160

Alim Class	
897,767	764,764
54,000	1.039,311
0,541	100,000
99,878	43,730

w_SAG	
Água ad (m³/h)	149,357

w_Peneira	
Água ad (m³/h)	69,953

w_Class	
Água ad (m³/h)	272,207

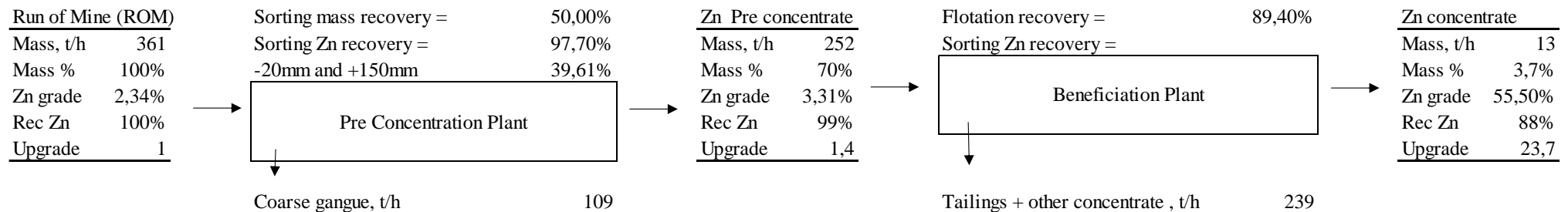
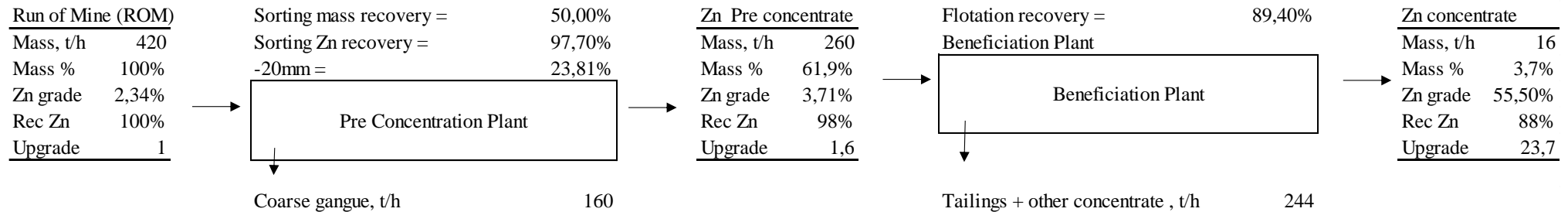
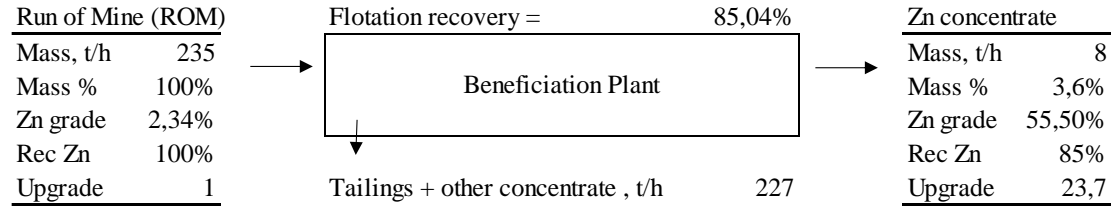
w_Bolas	
Água ad (m³/h)	12,375

SAG	
Potência (kW)	2.284,979
Fração VC	0,75
G.E. bolas (%)	12,000
G.E. bola+min (%)	25,663
Bola top size (mm)	152,000

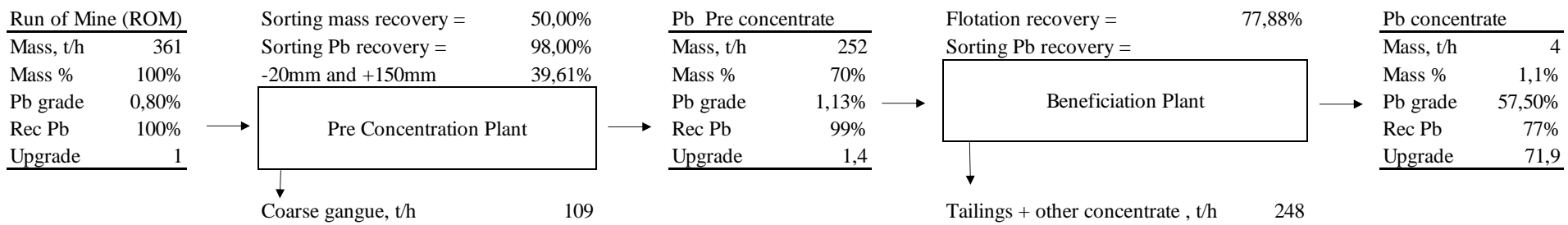
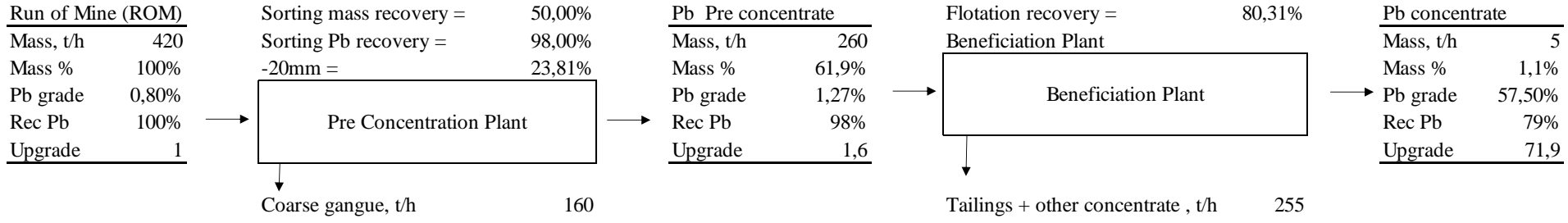
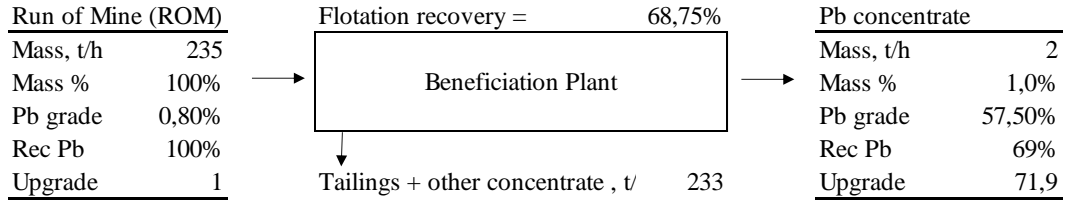
Bolas	
Potência (kW)	2.499,836
Fração VC	0,75
G.E. bolas	0,33
Bola top size (mm)	65,000

Class	
Pressão (kPa)	67,601
Unidades operando	3
Vortex (m)	0,2
Apex (m)	0,127
Água p/ OF (%)	65,889

# / Metal Balance (Zn)



# / Metal Balance (Pb)





# / Integration: Simulation and Metal Balance

Parameter	Unit	A	B	C
Preconcentration feed	t/h	235	420	361
Number of SBS		-	4	4
Preconcentration Plant: Power	kW	-	1260	1320
New feed SAG	t/h	235	260	252
Measured power SAG (motor)	kW	2292	2285	2287
Measured Power BALL (motor)	kW	2500	2500	2500
F <sub>80</sub>	µm	121893	109136	134880
P <sub>80</sub>	µm	139	129	128
Total water consumption	m <sup>3</sup> /h	476	504	478



**Resources quantification to generate 1t of Pb and Zn concentrate**

Parameter	Unit	A	B	C
Water usage	M <sup>3</sup> /t	45	25	28
Energy usage	kWh/t	464	308	363
Tailings	t/t	21	12	14
Coarse gangue	t/t	0	8	6



**CONCLUSION**

## / CONCLUSION

- **“Sensor-based-sorting”** test indicate that the preconcentration of the Aripuanã ore can be performed with a **50% mass rejection**, resulting in Pb and Zn **recoveries greater than 97%**.
- Considering the material PSD, this represents a **37% mass reduction** at the processing plant.
- The addition of a preconcentration stage also presents a direct effect on feed plant **PSD, BWi and Axb**.
- JKSimMet simulations indicated that the combination of those effects resulted in an **additional 10% capacity** for the grinding circuit.
- The upgrade on plant feed material presented an impact on flotation stage, thus increasing the overall metal recovery.



## / CONCLUSION

- The addition of a preconcentration stage through **“Sensor-based-sorting”** technology, resulted in:
  - 56% water usage;
  - 66% energy consumption;
  - 57% fine waste generation.

# **/ CONTACT**

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**THANKS.**  
**Questions? I am available.**

