Kashigar Mineral Processing Research Center

SAG 2019

Mining Engineering Department
Shahid Bahonar University of Kerman

Challenges of Using Advanced Control Tools (ACT) System at the Sarcheshmeh Copper Complex SAG Mill Circuit

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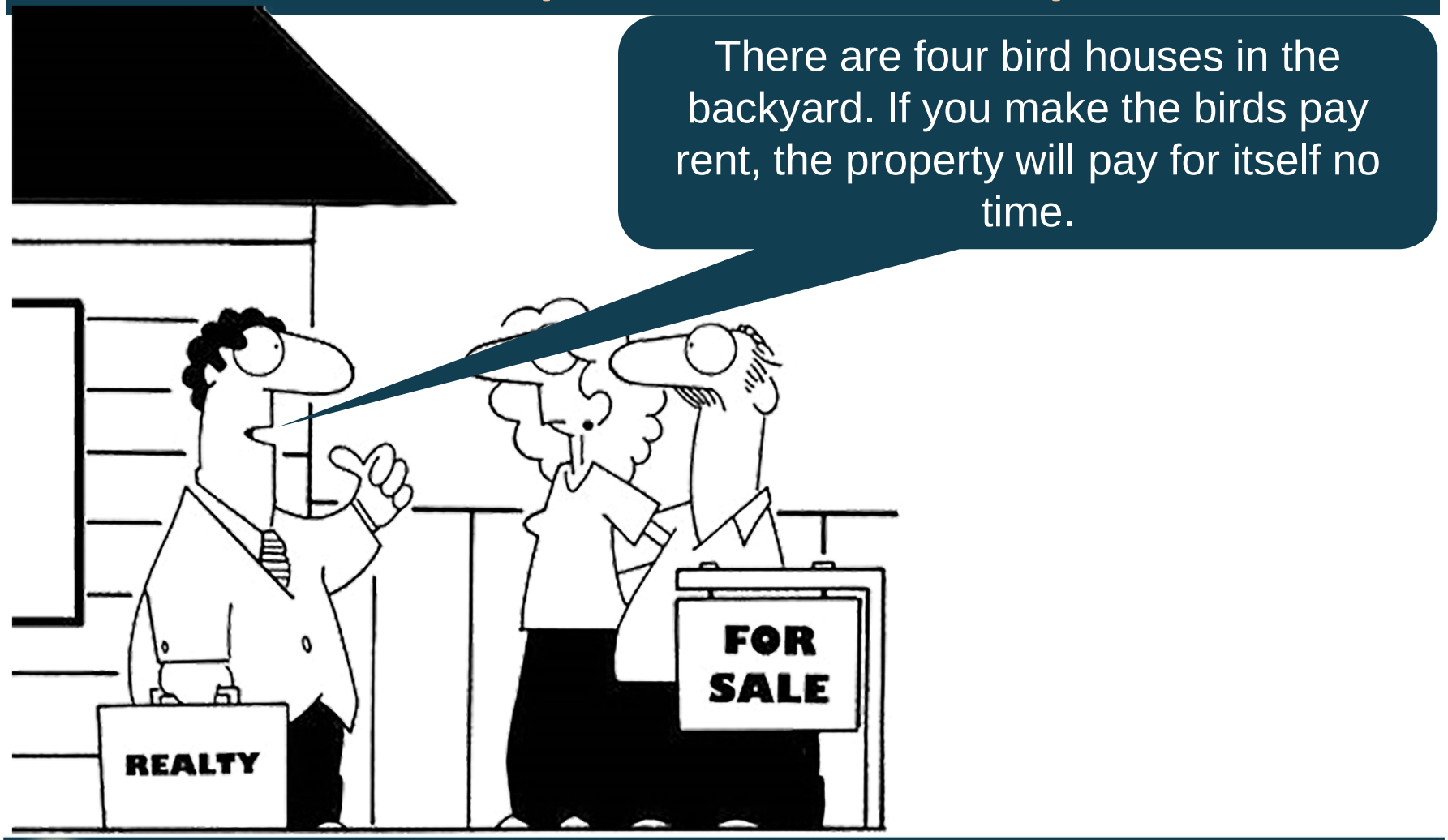
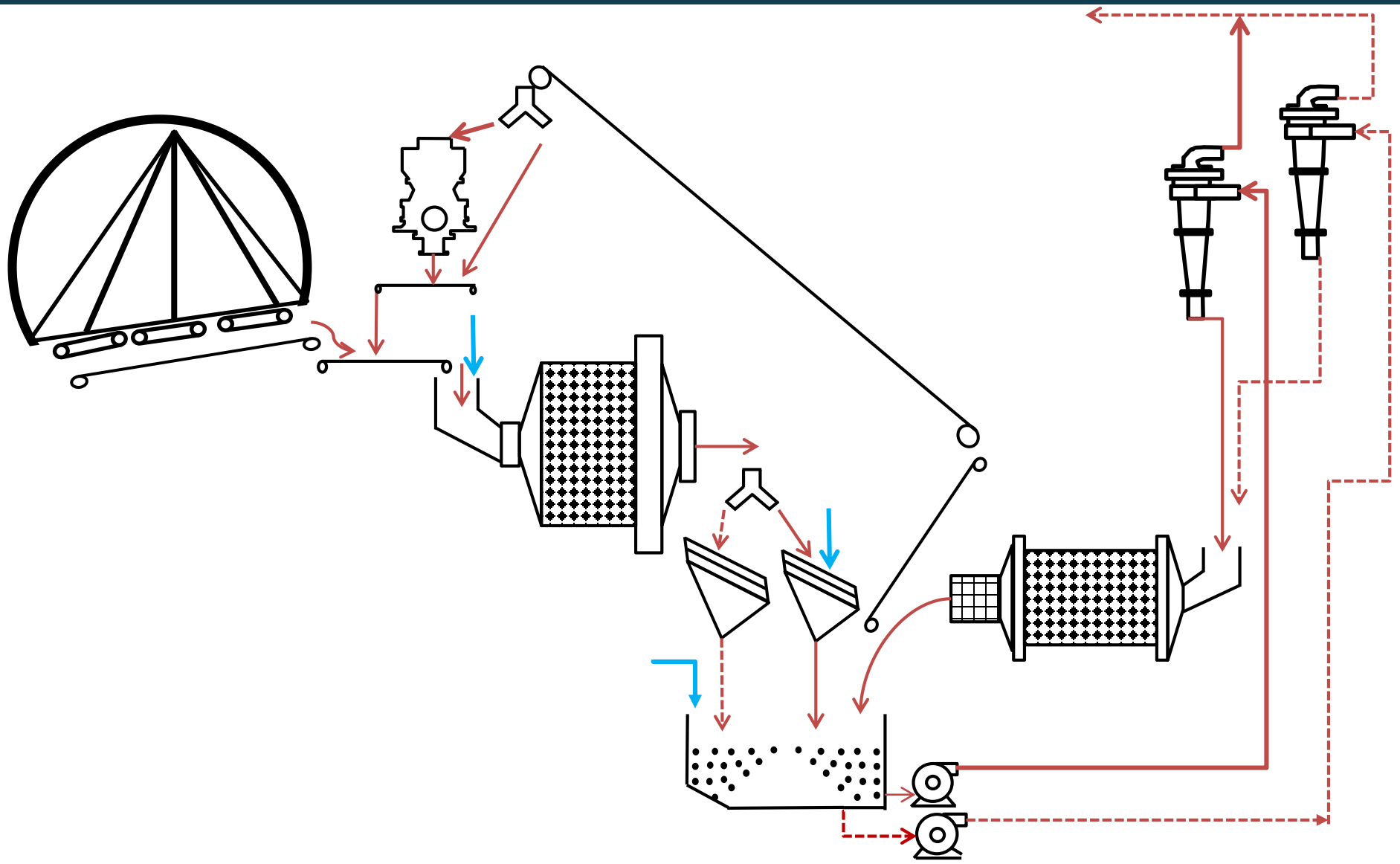
The Bitter Reality

Our Expectation and Reality



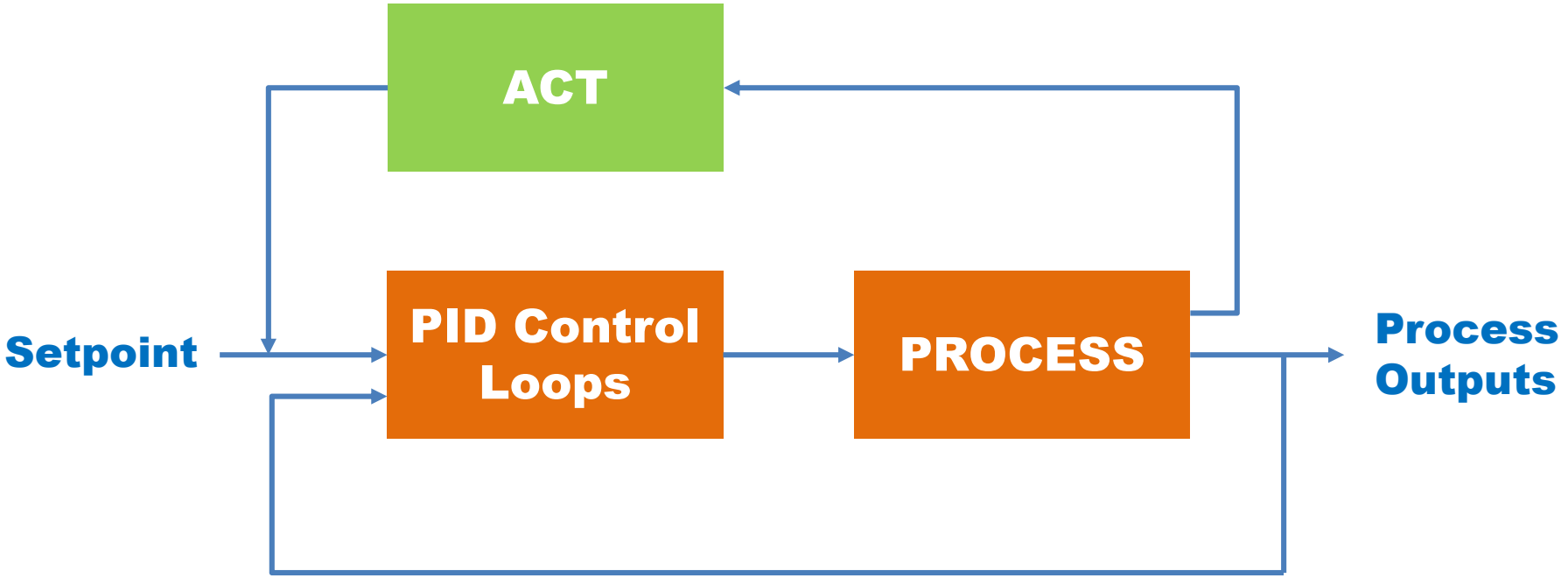
Plant Managers:
The Advanced Control Tools will save us, don't worry!

The Sarcheshmeh Copper Complex Grinding Circuit



Advanced Control Tools (ACT)

Conversion of practical process knowledge to simple rules of process control



Manipulation of setpoints, activation of motors and valves

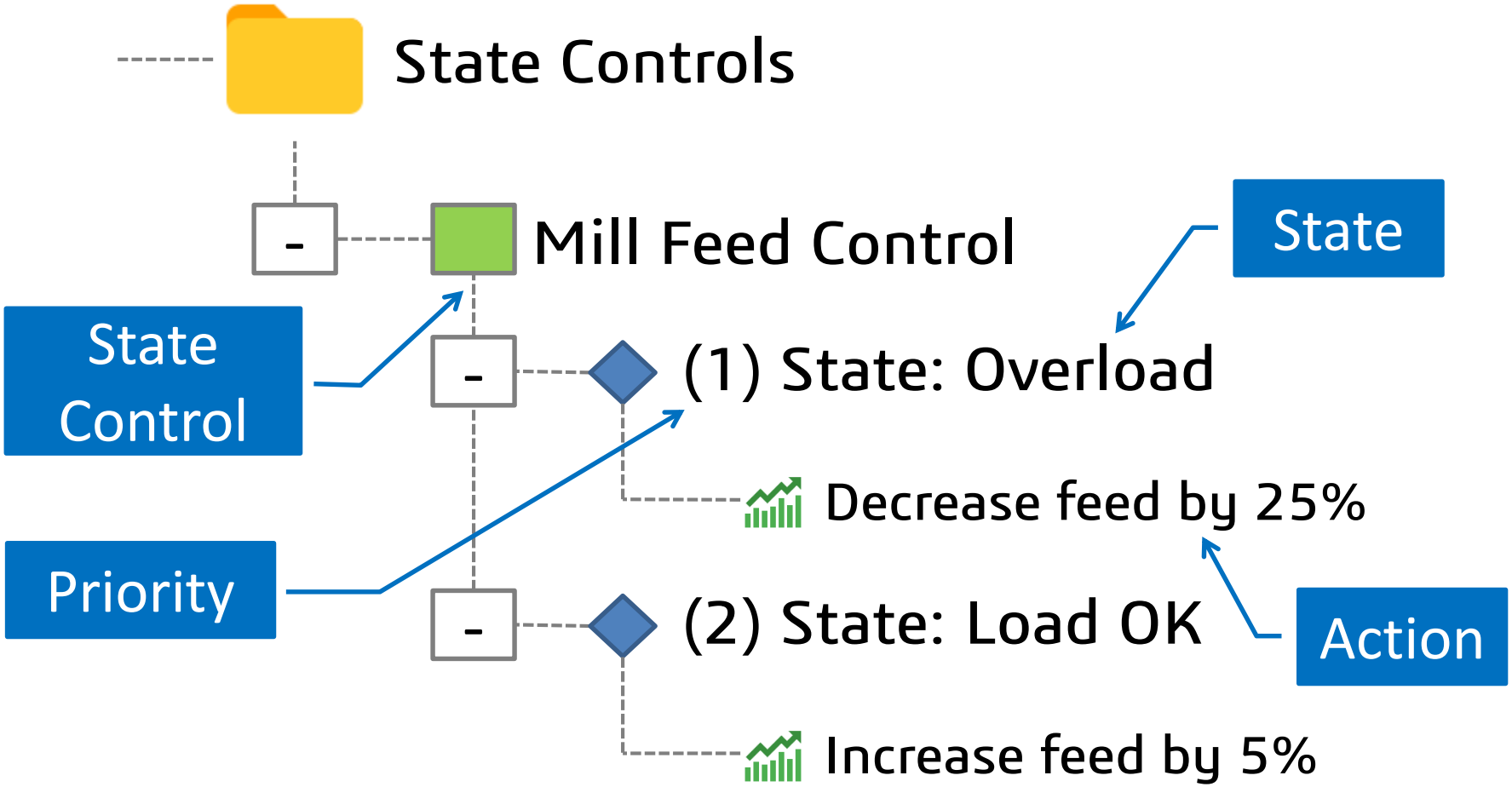
Main Method of Control Process in ACT

Rule based control methods

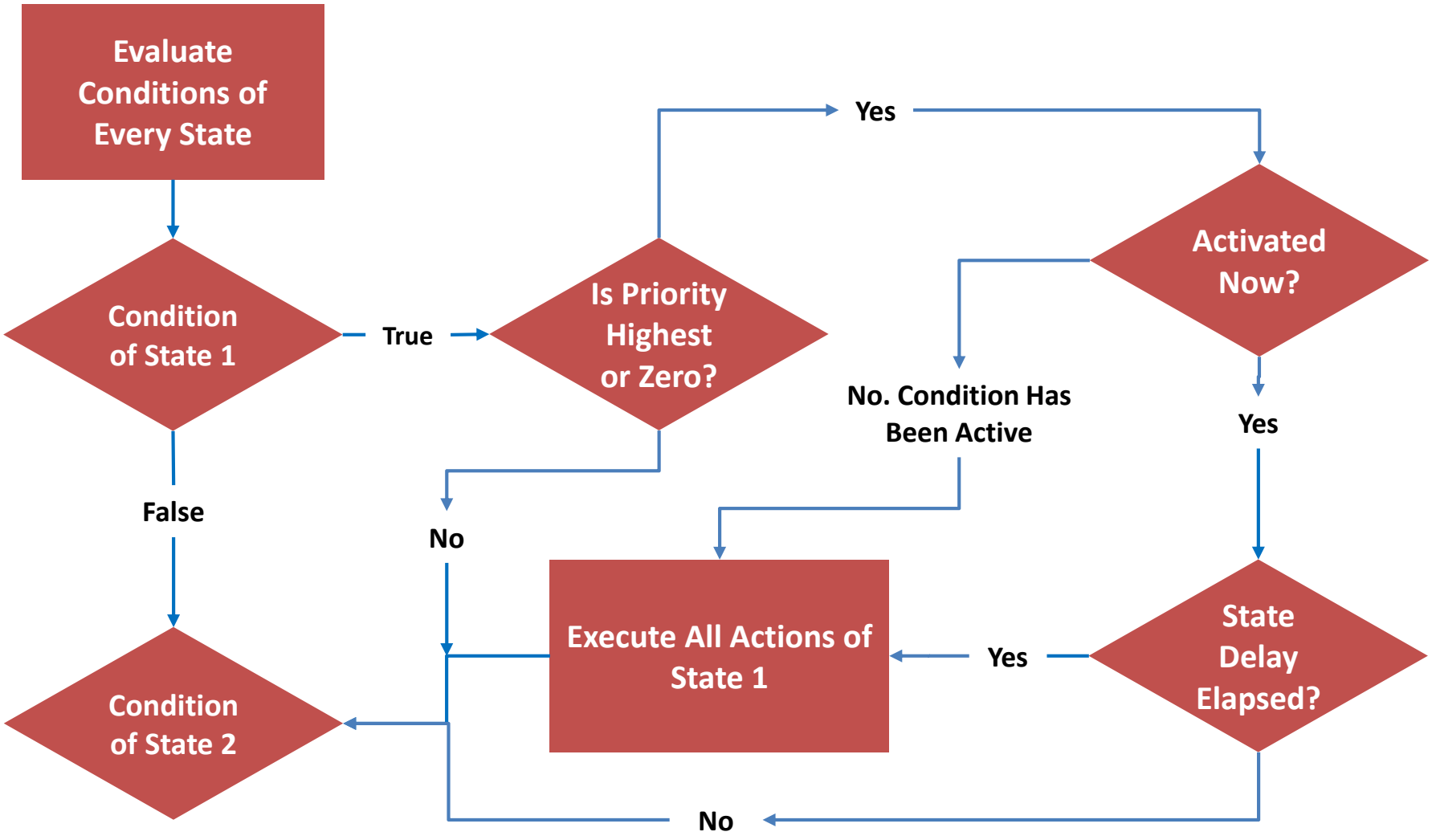
State Logic Control

If SAG mill weight is too high, increase SAG mill speed by 2 RPM every 2 min

State Control Basics



Execution of One State Control in ACT



Definition of Control Limits

SAG Mill	Low	High	Mv
Weight (t)	220	265	225.02
Power (kW)	4155	5400	4568
Speed (RPM)	160	195	191

Definition of Control Limits

Ball Mill	Low	High	Mv
Weight (t)	590	740	623.82
Power (kW)	5500	8100	7182.92

Cyclone Battery	Low	High	Mv
Pressure (kPa)	40	65	55.74
Density (t/m3)	1.4	1.8	1.6

Definition of Logic Limits

SAG Mill	
Weight Very High (t)	265
Rejected High (t/h)	190
Weight ROC (t/10min)	9
Weight Fast ROC (t/10min)	10

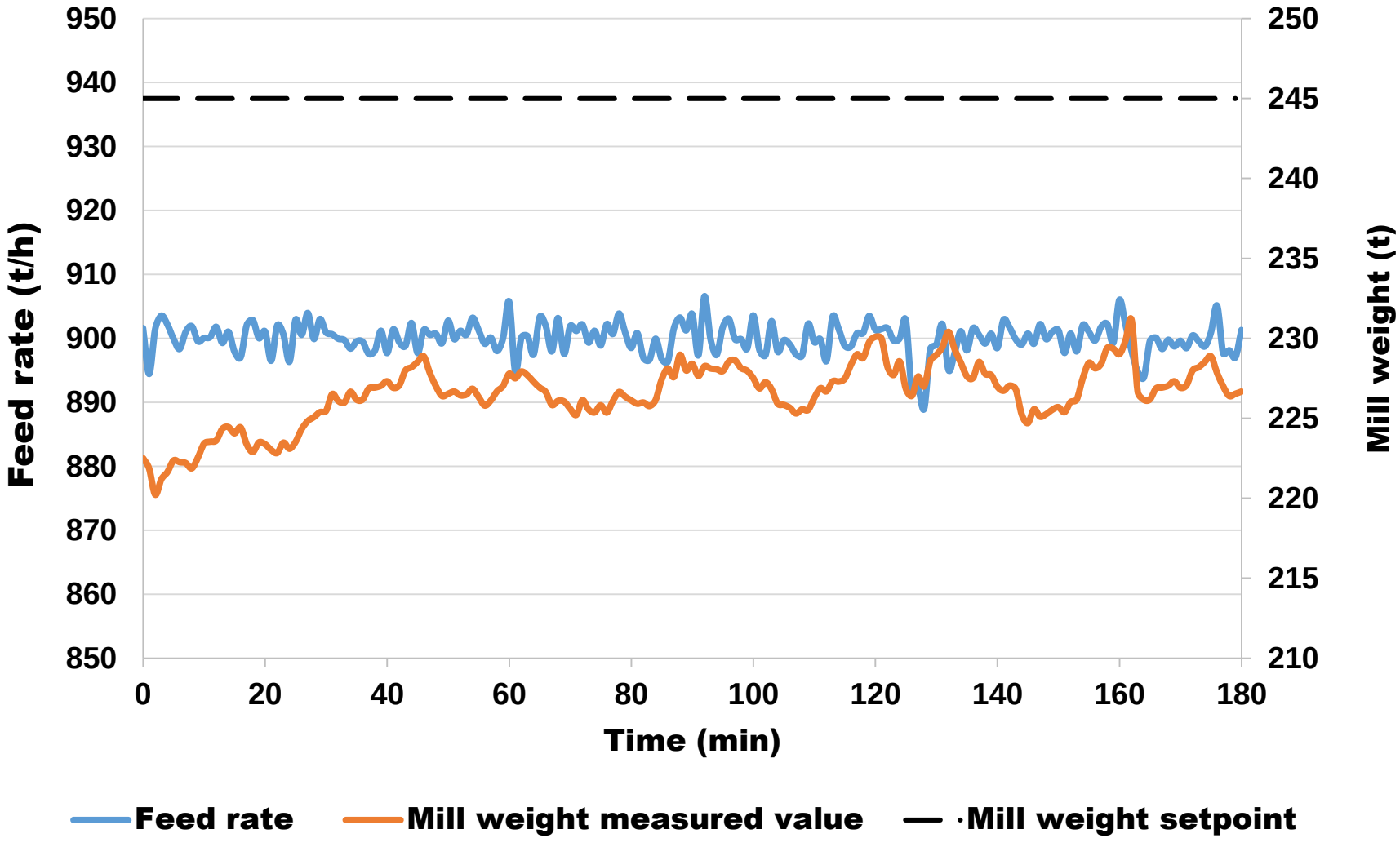
Description of States

States	Step	Interval
SAG mill feed too low, decrease speed	-2	4
SAG mill weight too low, but decreasing, no action	0	0

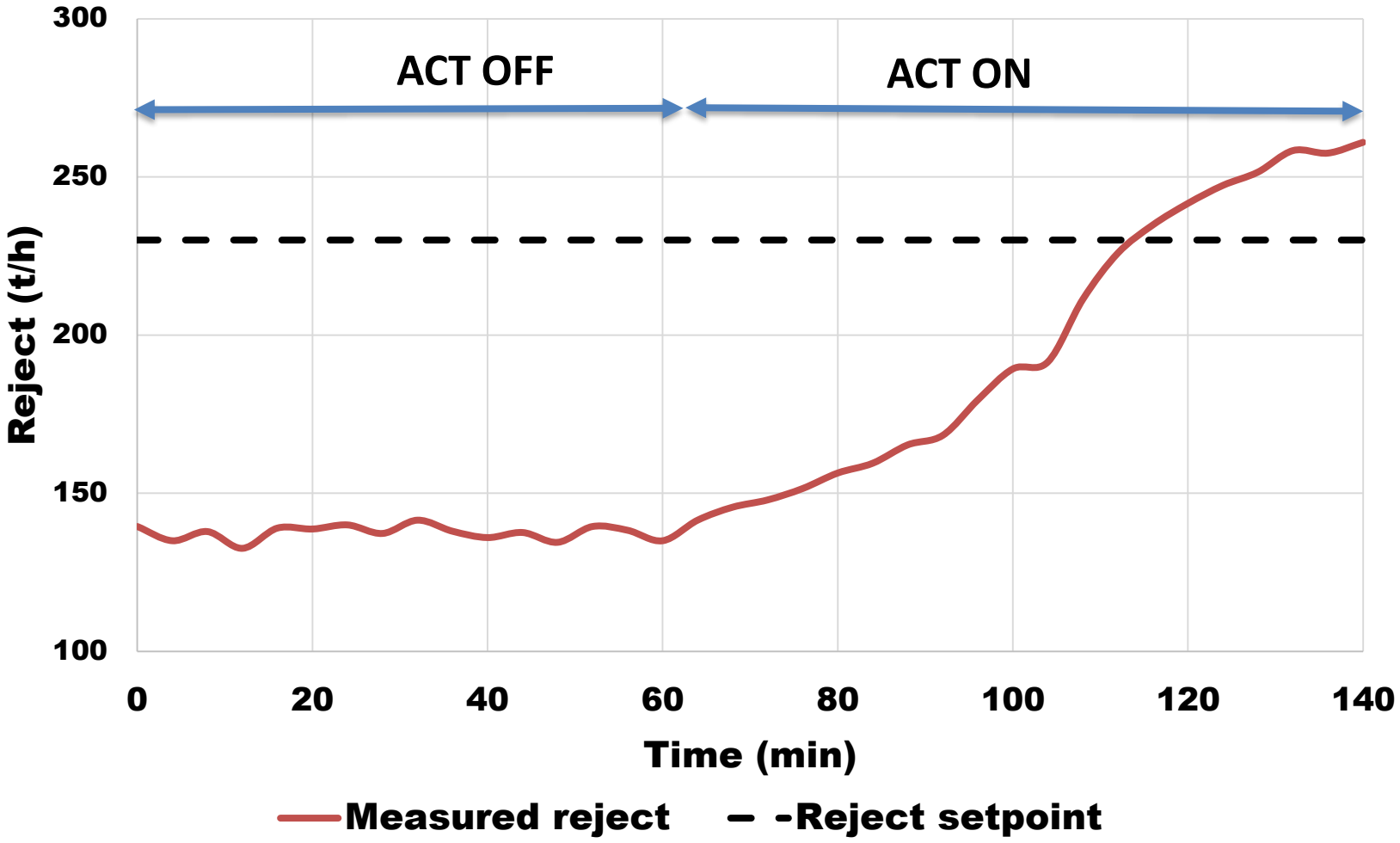
Example: Feed Rate Control

Mill Weight	Value
MV	250
SP	240
Step (t/h)	-20
Interval (min)	4
Status	SAG Mill Weight too High, Decreased Feed
Next Step	230

Challenge: unable to reach mill weight setpoint



Challenge: unable to control reject tonnage

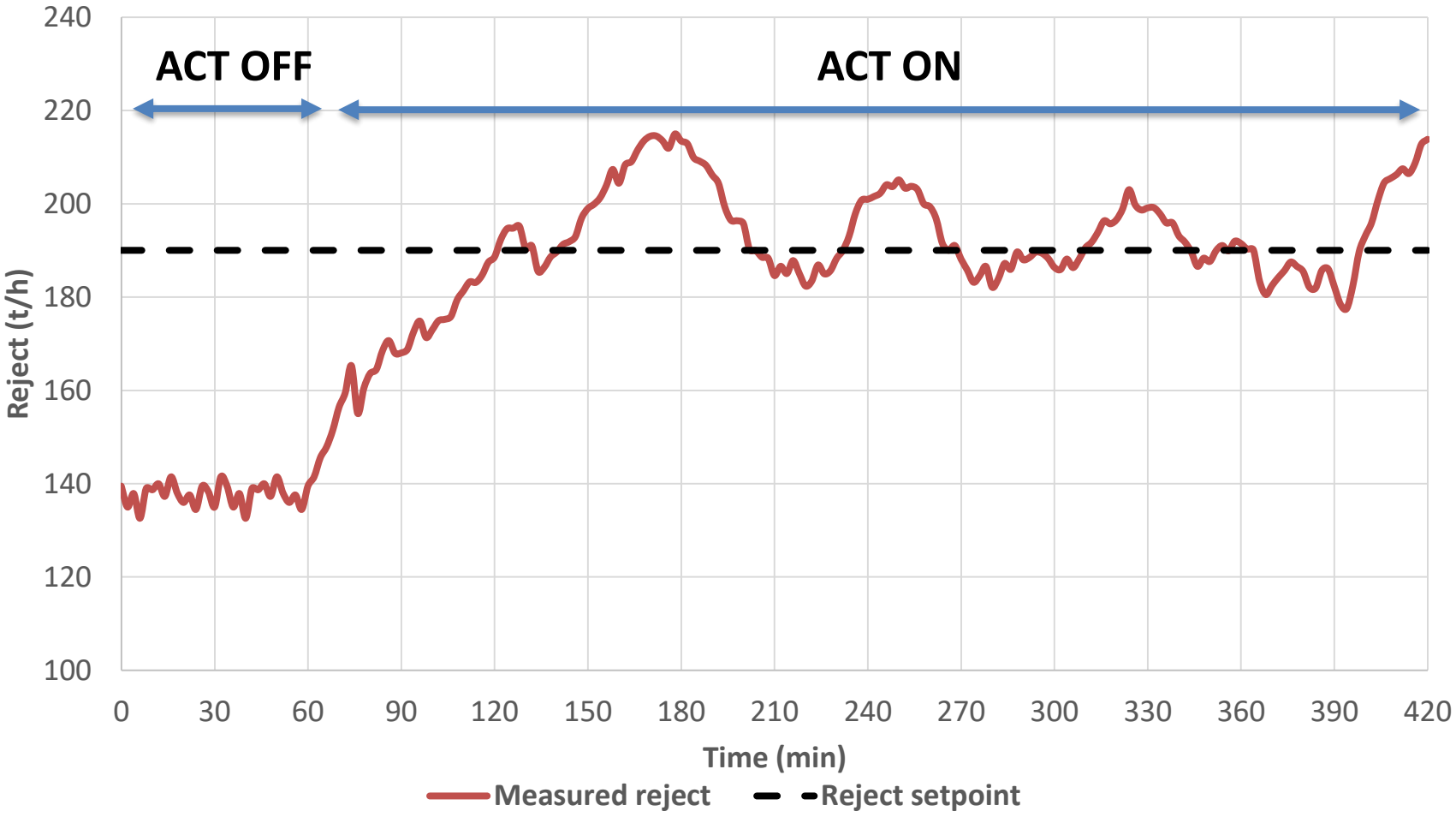


SAG mill parameters redefinition

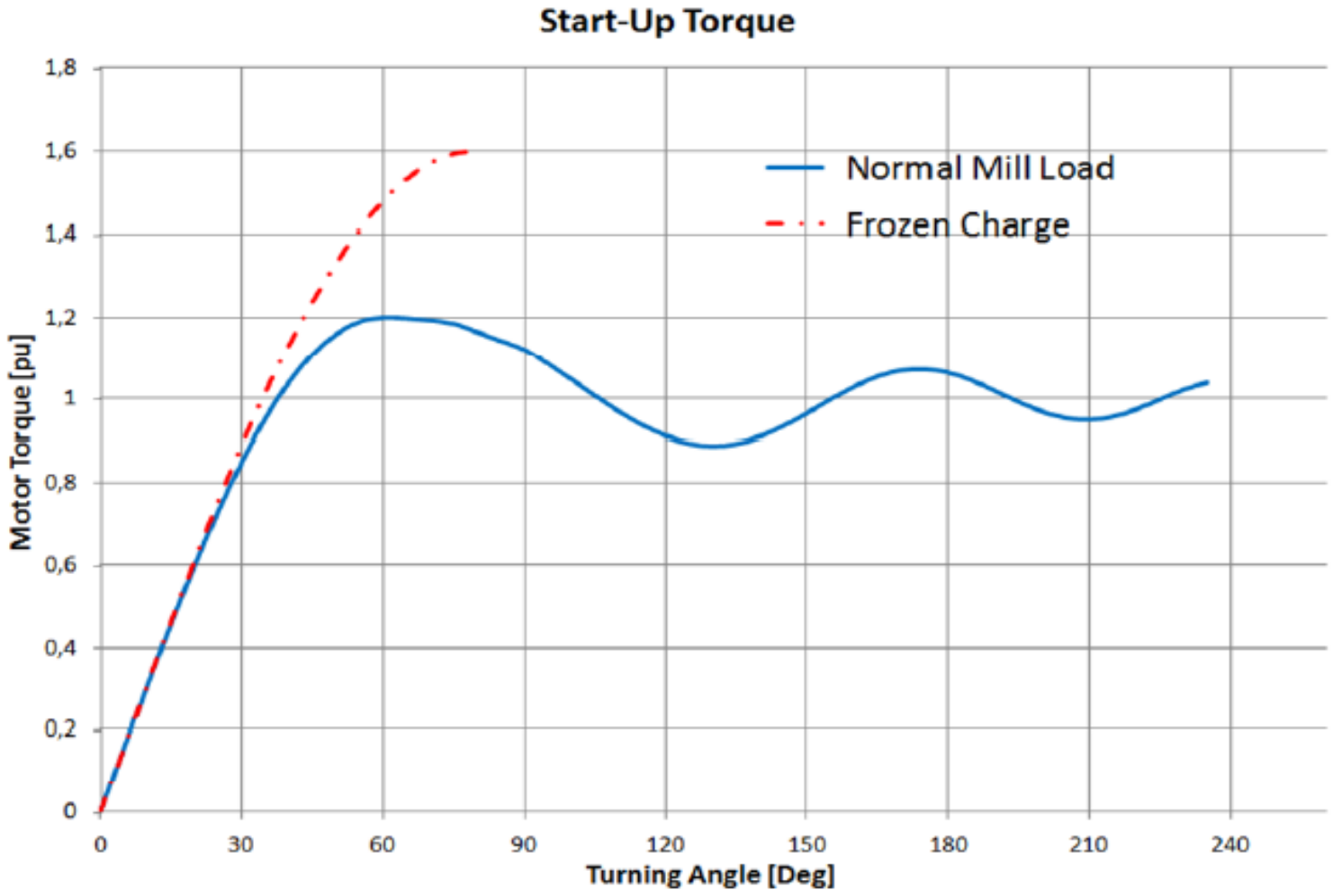
	Initial		Changed	
	Low	High	Low	High
Weight (t)	200	300	210	255
Feed Rate (t/h)	600	900	800	1150
Reject (t/h)	230		190	

Good control of feed rate

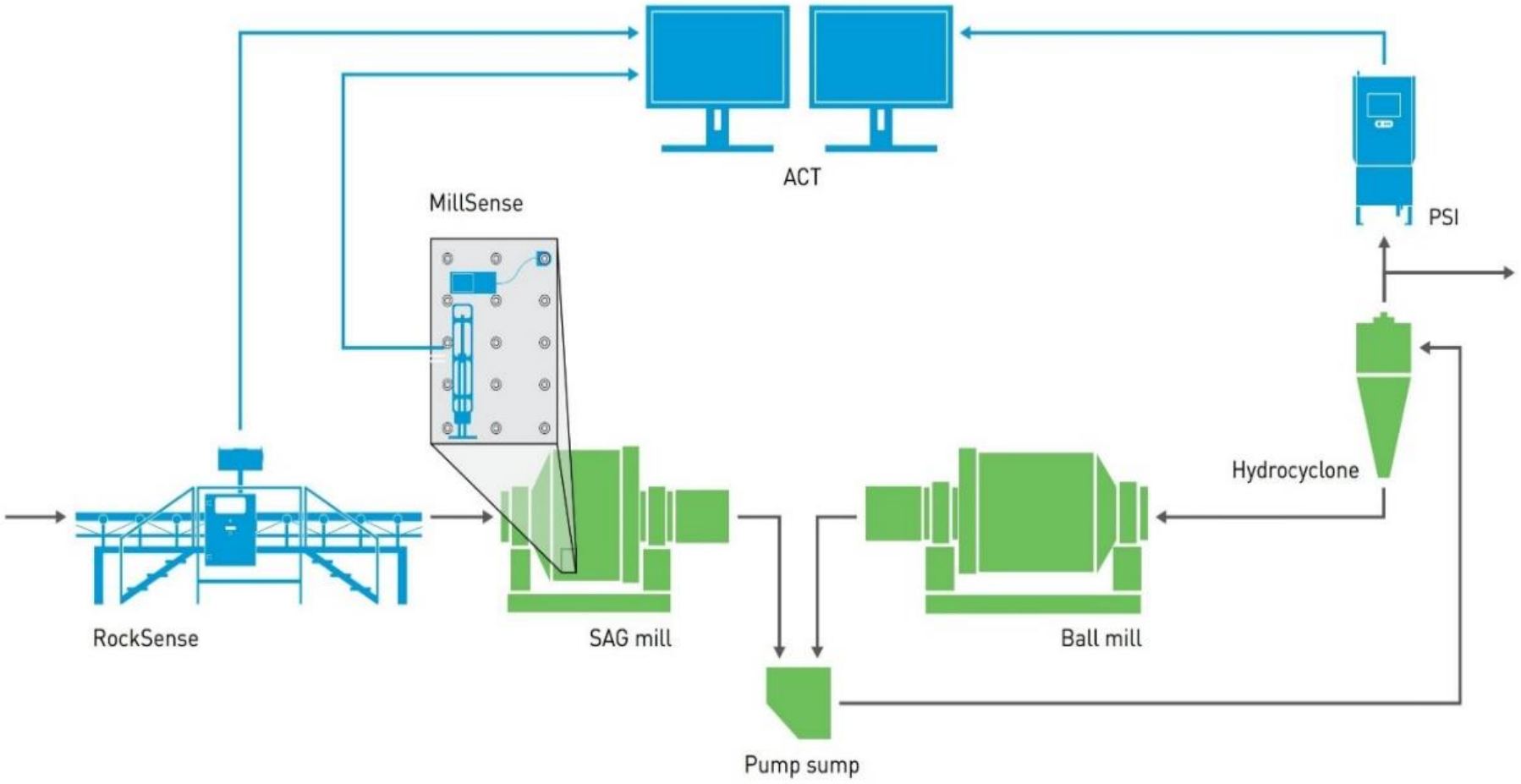
Reject tonnage controlled near the setpoint



Frozen charge detection



Ideal View of ACT Function at the Grinding Circuit of the Sarcheshmeh Copper Complex



Conclusions

Without intelligent involvement of operators no control systems could help your plant, even ACT

Acknowledgements

- Sarcheshmeh Coper Complex
- Shahid Bahonar University of Kerman
- Vali-E-Asr University of Rafsanjan