

**XPSFloat™**  
Flotation level measurement

# XPS Process Control

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XPS – February 2014

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## Abstract and General Topic for Keynote Lectures

by P. Thwaites

Manual Control, Process Automation – or Operational Performance Excellence?  
What is the difference?

The mining industry uses many types of mineral and metallurgical plants to produce saleable product from ore mined. Plant design history has left current operations with a mixture of manual operation and various forms of automated process controls. Consequently, we typically see high variability in the continuous operations together with a shortfall in the attainment of full capacity, or higher utilization of consumables.

At a level of best practice, 'Operational Performance Excellence' focuses on process control, using automation and control systems to deliver process optimisation. This more sophisticated delivery is a great deal more difficult than the first stage of equipment selection / installation.

It includes the appropriate selection of the right instrumentation, control system, key process knowledge, individuals with a solid control engineering background / experience, and the essential backing / support of the operations management team together leading to higher value delivery.

Robust solutions can be realised, considerably minimising process variation, thus leading to process optimisation.

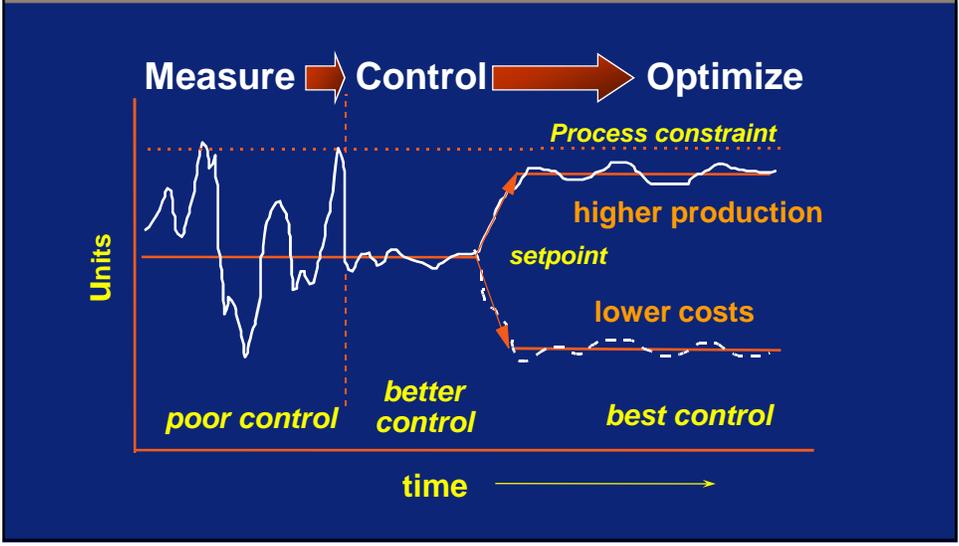
This approach results in an easier, efficient and safer process while providing considerable returns for the plant owners.

*How variable are your processes, and do you maintain optimised process performance with dedicated resources, modern instrumentation, 'best practice' control systems and performance monitoring tools?*

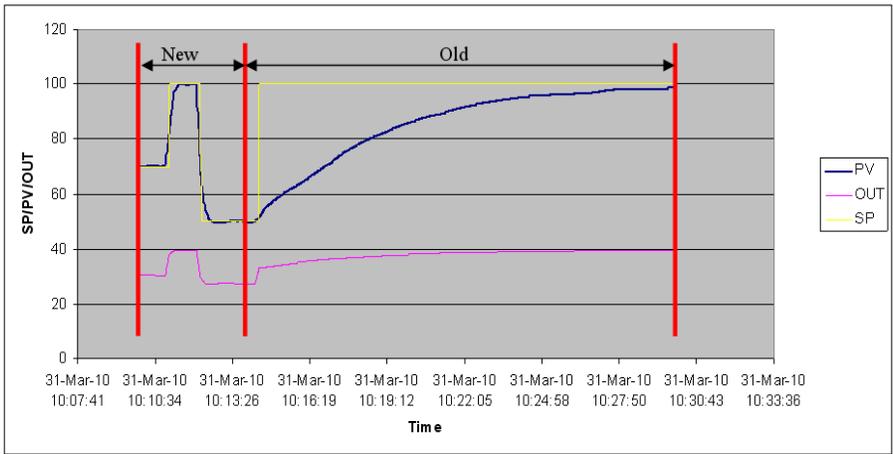
*In my keynote address, these questions and possible answers are discussed.*

*I say we can do MUCH MORE and be More Efficient. This area remains a major opportunity for improved efficiency, minimizing tailings losses and other costs.*

# Process Control



# Importance of Regulatory Loop Tuning (air flow loop)

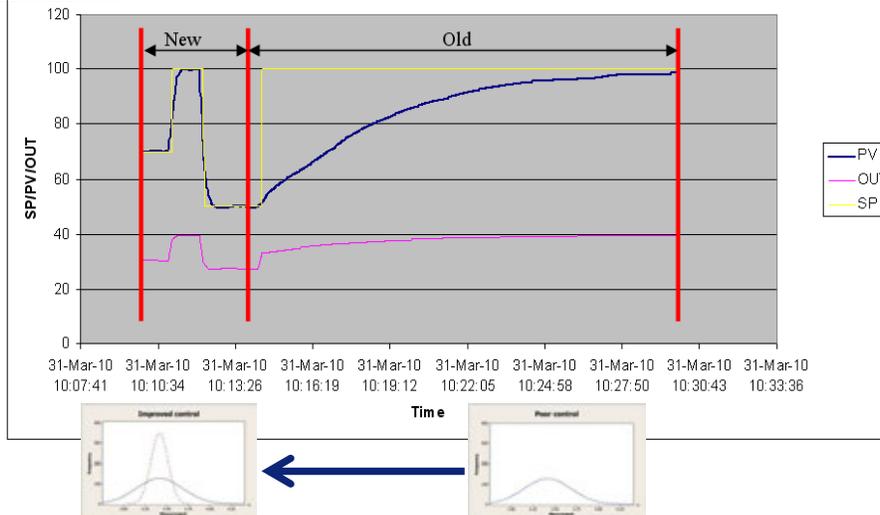


## Importance of Regulatory Loop Tuning (air flow loop)

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*Retuned, Old to New .....  
Poor to Improved, prior to Optimized*



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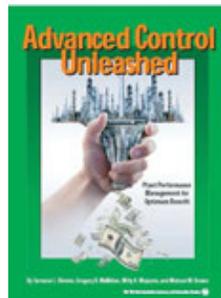
## Control Tuning Summary

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*Don't underestimate the impact!*

***“Proper controller tuning is the largest, quickest, and least expensive improvement one can make in the basic control system to decrease process variability.”***

– T.L. Blevins, G.K. McMillan, W.K. Wojsznis, M.W. Brown, **Advanced Control Unleashed**, ISA Press, Research Triangle Park, NC, 2003.



N.B. Book was inspired by DeltaV  
Advanced Control Products.  
Available from ISA or may be ordered at  
[EasyDeltaV.com/Bookstore](http://EasyDeltaV.com/Bookstore)

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## Flotation Objective?

1. Always Prevent Flooding ... *or empty banks &*
2. Maintain an Accurate, responsive Pulp Level, on a second basis, thereby allowing control *of the setpoint*.

**Note, pulp level is the variable known to the Operator and is usually correlated to mass pull and recovery.**



## XPSFloat™ Flotation level measurement



Contact Us...

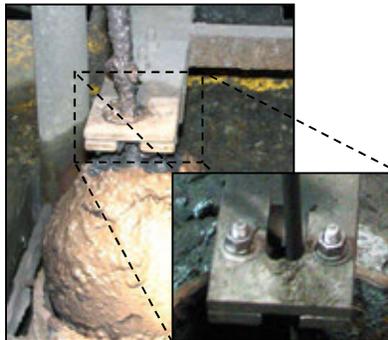
Address: Process Control XPS Centre, Falkenberg, Ontario, P0M 1S0, CANADA  
Phone: +1 (705) 699-3400 Ext. 3653 / 3414 / 3418 Fax: +1 (705) 699-3411  
E-Mail: [processcontrol@xps.ca](mailto:processcontrol@xps.ca)



## Level Measurement Access to floats

### No access to clean floats

- Build up on floats
- Inaccurate reading



### XPSFloat™

Flotation level measurement

- implement quick access to floats
- Cleaning water to rod



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## Level Measurement Float design

### Ball



### XPSFloat™

Flotation level measurement



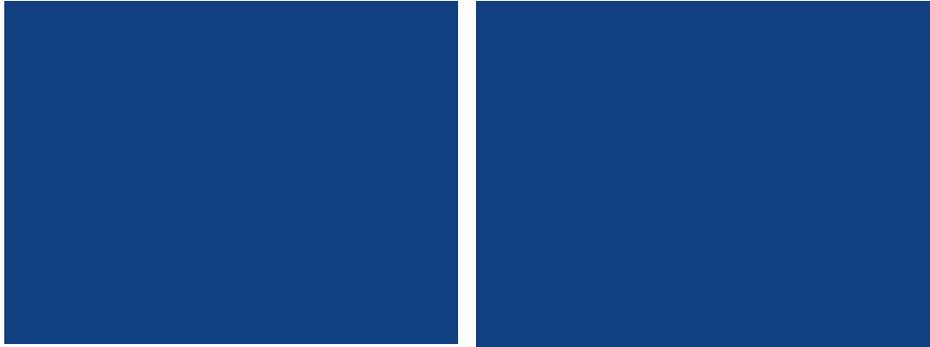
# Level Measurement Float design

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Ball

Vs

**XPSFloat™**  
Flotation level measurement



Development Team: E. Nunez, (XPS), A. Punkkinen (Plate Shop), D.Rioux (Instrum.), S. Del Carpio (XPS)

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**XPSFloat™**  
Flotation level  
measurement

10" diameter, 0.050" thick  
with 3/8" diameter hole

SS Tubing TP316/316L, CLS  
3/8" OD x 0.083" wall x 72"

Teflon FDP  
3/8" ID x 1/2" OD x 72"

Bolt and washer

UHMA-White

Bolt and washer

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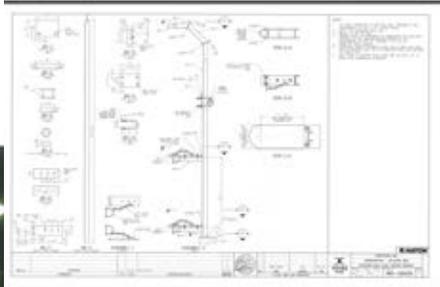
### 2012 Updates:

Rod length = 4', 5' or  
6' (72")

Shaft is 316 stainless  
steel, seamless rod tube -  
3/8"OD x 11GA (.125  
wall), tapped at either end  
for:  
5/16" securing bolts

Teflon tubing covers shaft  
& uses a fine water spray  
for lubrication

## Stand Details



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## Flotation Level Measurement Retrofit..... Mandalay Resources, Cerro Bayo Ag-Au Mine

Instrumentation Upgrade by E+H Chile,  
(C. Aravena), & Sedgman, Chile using XPSFloats™

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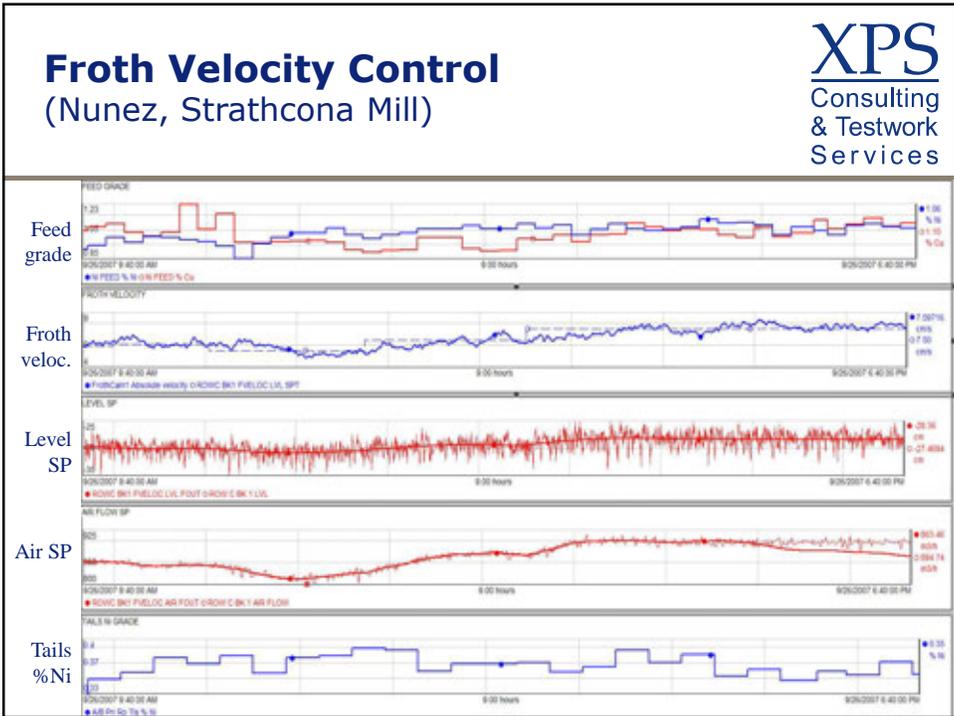
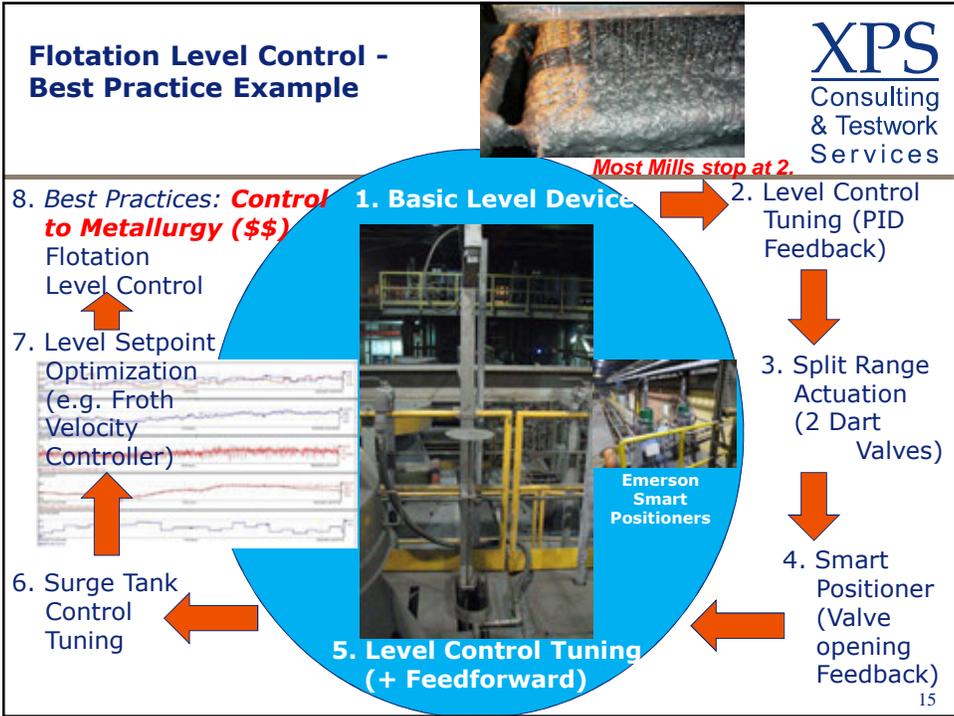
The Cerro Bayo district is located in southern Chile, just inside Argentina approx. 130 km south of Coyhaique, the capital of Region XI, Chile.

This district is part of an emerging precious metals province containing the Cerro Bayo & El Toqui mines in Chile, & several mines, exploration projects extending east - Argentina.

Ramp-up to the currently planned 1,200 tpd ore processing rate was completed Qtr 4, '12.



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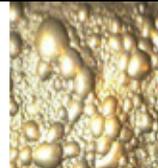
## Notes on Calibration

- **Strathcona Mill use a calibration range of:**
  - -55 (21.65") to 0 cm; and **-72 (28.35") to 0 cm .... the preferred standard**
- **Should have a consistent span, below the lip, - 72 or - 55 cm, as Strathcona Mill; or - 20 cm (8" ) or - 30 cm (11.8") for smaller cells.**
- **Instruments need to have the (just) flooding point of 0.0; and then measure below the lip i.e. -10 cm etc.**
- **Very important to have the ultrasonic instruments calibrated consistently with a span of 0 to -30 (or -20) cm. So 4 mA would be the -30 cm and 0.0 (flooding) the 20 mA.**
- **Check that the HMI has the same calibration and shows the same range.**
- **Do the step changes (of output) and loop tuning as dealt with in Martin's 'XPS Best Practices Process Control' course.**
- **There should be no offset between set-point and measured value and the cell should respond quickly to changes in setpoint. If possible, use Feedforward.**
- **Finally identify SP values to operate for different flotation conditions:**
  - Generally, higher recoveries will required less pulp level - below the lip.
  - Higher grades more pulp level below the lip.
  - Expect an optimum range – and operate within this range.

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## Flotation

... ref: Akzo Nobel - Cellulosic Specialties (Depramin gangue depressants)



*In an ideal situation,*

**collectors should absorb selectively on the valuable minerals, and**

**depressants should absorb selectively on the unwanted gangue minerals.**

**Unfortunately, this is almost never the case & the right combination of collectors and depressants**

- 1. require the development of dedicated chemicals; &**
- 2. a lot of fine-tuning in the flotation process.**

**i.e. Control for: Operational Performance Excellence.**

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**Reagent Dosing & Measurements**  
*Are you using Coriolis??*  
*Why wouldn't you?*



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**Flotation Reagent Control -**  
**Best Practices Example (of Operations Excellence):**  
*Metallurgical (Met.) Control is really the goal here .....*

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**8. Best Practices**

**Flotation reagent Control**

=> Optimum Metallurgy (\$\$)

**+ 25% lower reagent costs**

7. Met. Control  
*with feedback*  
**Optimization**  
 (Mass Pull;  
 Analyzer  
 recovery or  
 froth quality)

6. Met. Control  
*with strategies for*  
**start-up, shutdown,**  
**& short stoppages,**  
**or losses in XRF**  
 data

1. Basic Measurement  
 Mag meter, or Coriolis,  
 or pulsed device?



**Robust Reagent Control**  
 (Feedforward only)

2. Specialty  
 (pure, undiluted)  
 collectors?

3. Flow Control  
 tuning (eng.  
 Units)

4. Ratio Control  
 g/Tonne

5. Met. Control  
 (Ratio) GMU  
 g/Metal Unit

**Always use Coriolis for HIGHEST Precision, Accuracy – this is your consumable!**

## Plant Asset Monitoring (at the Instrument level)

AMIRA P893 (2005) Concentrator Benchmark Study – Section 7 Future Needs:

**“The first need is to solve instrumentation problems by means of predictive maintenance and fault detection. The use of “hard technologies” such as smart instrumentation Fieldbuses and ‘soft’ technologies, such as multivariate online analysis shows a great potential on this topic.”**

### Leverage intelligence in device:

- Key is use of some information bus (HART, Profibus, FF) to access parameters
- Want to integrate all devices

### Desired benefits:

- Increased performance:
  - Higher online time
  - Assets properly configured and calibrated
- Decreased cost:
  - Reduce unnecessary work
  - Reduce effort to accomplish a task

### Two main technologies:

- EDDL
- FDT

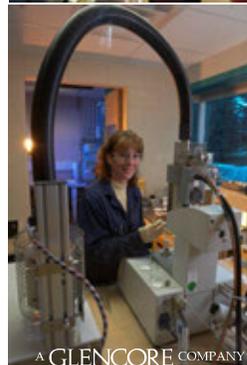
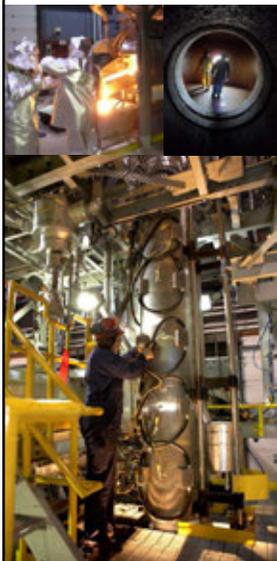
### Functions in asset monitoring:

- Configuration; Calibration
- Performance monitoring & Troubles



For More on XPS  
see: [www.xps.ca](http://www.xps.ca)

**Process Mineralogy**  
**Extractive Metallurgy**  
**Process Control**  
**Plant Support**  
**Materials Technology**



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