Valmet Solids Measurements

Robust in the Most Difficult Environments

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Waste water treatment plan overview

Valmet **TOTAL SOLIDS** measurements

Microwave technique:
- Valmet TS
- Valmet DS

Optical measuring technique:
- Valmet LS

Sludge samplers:
- Valmet Nove
- Valmet Nove H

Valmet TS

Valmet LS

Valmet DS

Valmet Nove

Valmet Nove H

Reliable Wastewater Management Using *valmetTS* Solids Meter

The history of Valmet's microwave transmitters since 1993

- kajaaniMCA - "the mother of MetsoTS"
- Non intrusive
- Reliable - accurate – maintenance free
- Several thousand sold in pulp & paper industry

valmetTS
- Based on the corresponding total consistency transmitter
- Developed for wastewater plants

kajaaniMCA (3rd generation)

kajaaniMCAi (2nd generation)

kajaani MCA (1st generation)

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valmetTS Measurement Principle

- The transmitter measures microwave time-of-flight through the process pipeline and thus gives a representative measurement of the process medium passing through the measurement.
- The time of flight is dependent on the permittivity of the measured medium.
- The measured change in permittivity allows us to calculate the total solids content in the medium.
- Non-Intrusive
- Non-Fouling

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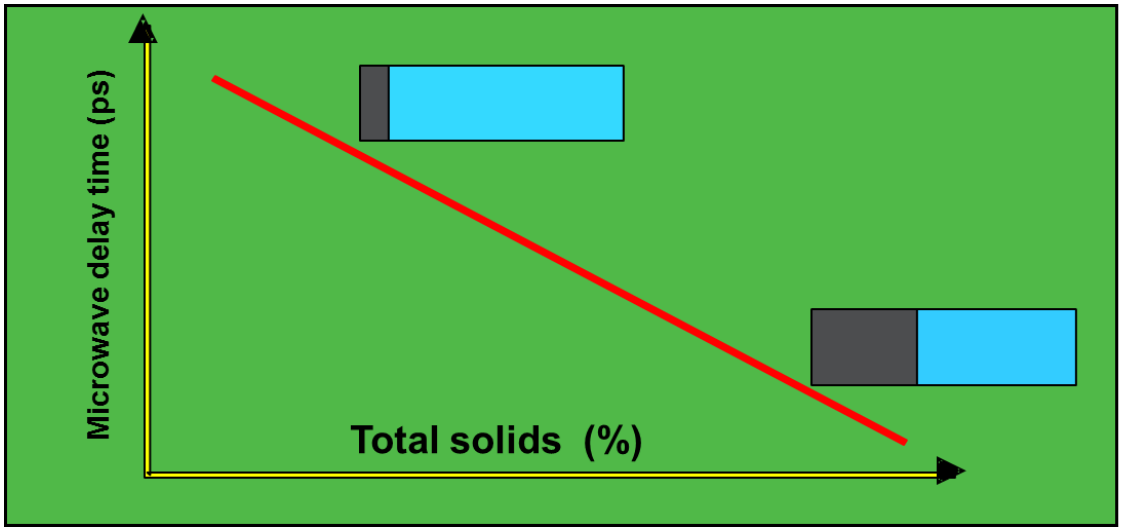
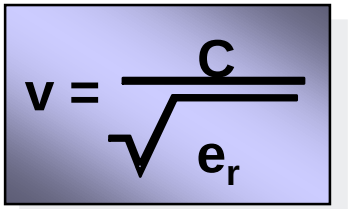
Measuring principle

- ***valmetTS™*** measures microwave travel time through the sludge.
- A linear relationship exists between microwave travel time and suspended solids.



Measuring principle

- Patented TS measurement principle is based on laws of nature
- The speed of microwaves (v) depends on the relative permittivity of material (e_r):



c = speed of light in vacuum
e_r = relative permittivity
(relative dielectric constant)

Material	Relative permittivity	Relative speed
Water	80	0.1
Organic *	~ 3	0.6
Inorganic*	3...7	0.4...0.6
Air	1	1

* organic: municipal sludge, fiber particles

* inorganic: various minerals (sand, fillers, etc.)

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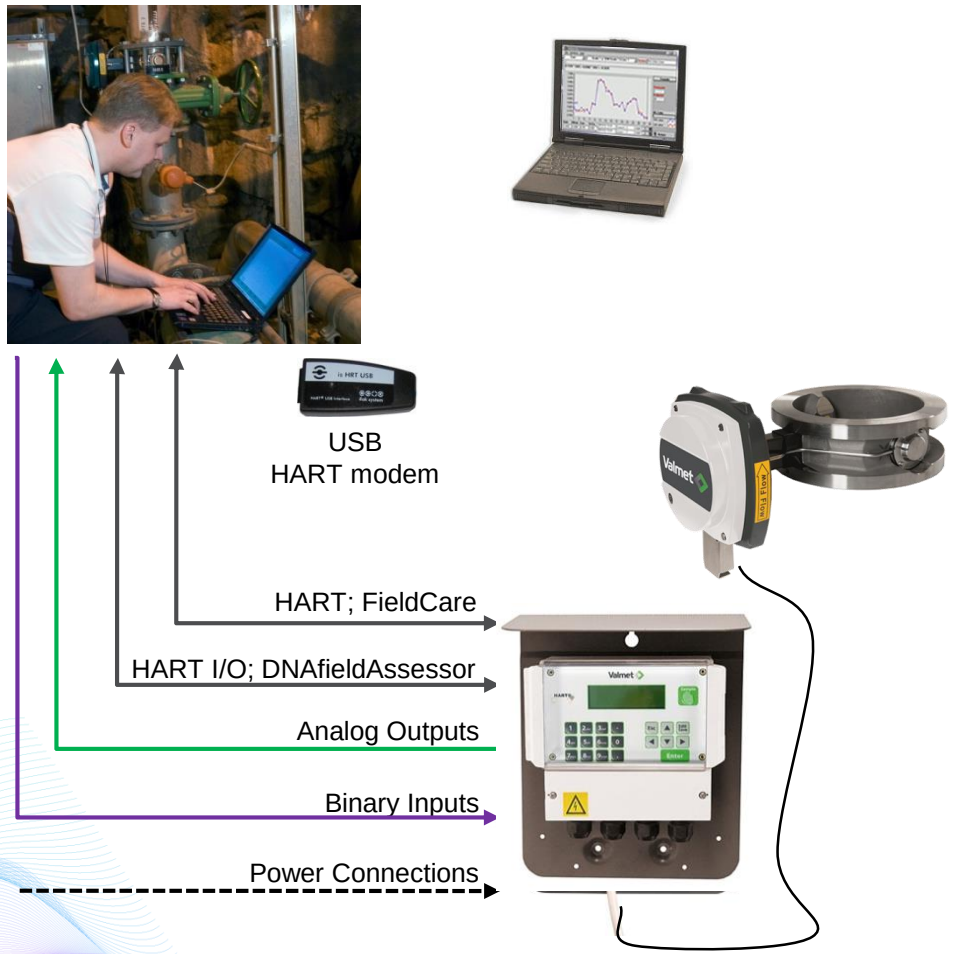
Valmet TS -Total Solids measurement

- A microwave measurement principle
- Sensor type and sizes:
  - Standard model PN16 /232 psi
  - Line Sizes:
    DN50, 75,100, 150, 200, 250, 300
    2”, 3”, 4”, 6”, 8”, 10”, 12”
- Measurement range: 0 - 40 TS%
- Organic and inorganic materials
- Sensitivity: 0.001 TS%
- Repeatability: 0.01 TS%
- Enclose class: IP65
- ATEX certification NEW !
  - Certificate No. VTT 12 ATEX 058X
  - **II 3G Ex nR IIC T6 Gc**
  - Area classification : Zone 2
  - For biogas / biofuel applications, where flammable gases (e.g methane) could exists.
- Communication
  - 4-20mA + HART® Total Solids
  - 4-20 mA Process temp. /-Conductivity
  - Profibus PA

Efficient Communication

- Interfacing with plant control systems is ensured with modern solutions that provide connectivity with FDT-based configuration and operation monitoring systems:
- mA+HART
- Profibus PA or Foundation Fieldbus
- DTM-descriptions



Applications

Sludge pumping

Wasting

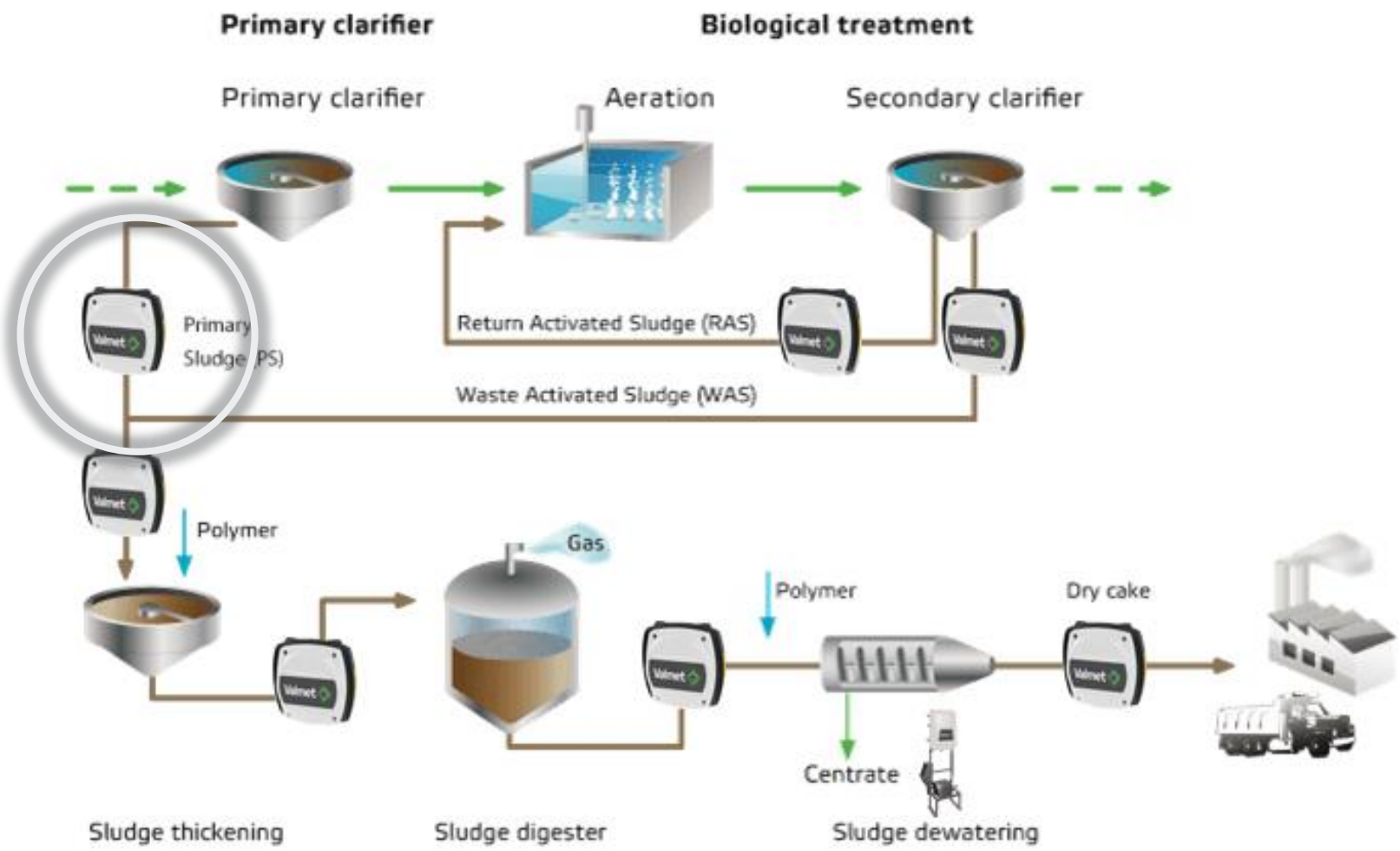
Thickening

Digesting

Dewatering

Dry cake

Primary sludge pumping control



Sludge Pumping from Primary & Secondary Sedimentations / Feed to Thickening

- Results:
  - Increased capacity
  - Prevent downstream hydraulic loading.
  - Reduced costs of the sludge pumping energy.
  - Guard against weather events
  - Guard against pulling water through the sludge blanket

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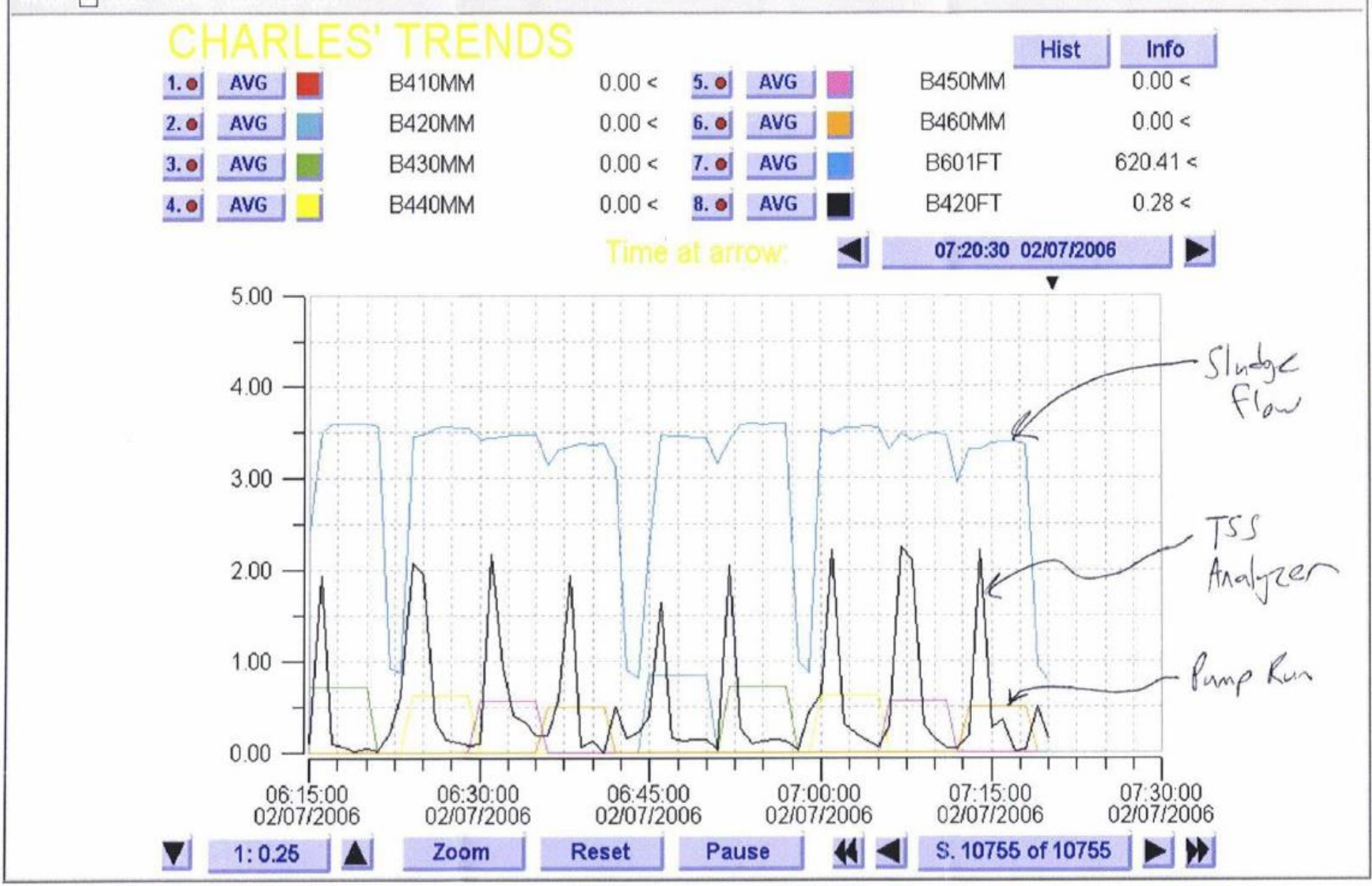
CHARLES' TRENDS
Hist
Info
1. AVG B410MM 0.00 <
2. AVG B420MM 0.00 <
3. AVG B430MM 0.00 <
4. AVG B440MM 0.00 <
5. AVG B450MM 0.00 <
6. AVG B460MM 0.00 <
7. AVG B601FT 620.41 <
8. AVG B420FT 0.28 <
Time at arrow
07:20:30 02/07/2006
5.00
4.00
3.00
2.00
1.00
0.00
06:15:00 02/07/2006
06:30:00 02/07/2006
06:45:00 02/07/2006
07:00:00 02/07/2006
07:15:00 02/07/2006
07:30:00 02/07/2006
Sludge Flow
TSS Analyzer
Pump Run
1: 0.25
Zoom
Reset
Pause
S. 10755 of 10755

Benefits realized with change from time sequence to inline

- Reduced number of tanks from (6) to (4).

- Changed aeration from constant (24-7) to minutes per shift.

  Power savings alone >$100 per day!

- Overall improvement in that they are always pumping solids to downstream processes not water !

- Operators know quickly when there is a problem with the sludge lines as the feedback is constant

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Customer Case: Greenway Primary Sludge Pumping Optimization
City of London, ONTARIO / Canada

Background

City of London, Environmental and Engineering Services, Pollution Control Operations, London, ON
The City of London in Ontario Canada operates six wastewater treatment plants with a combined average daily flow of ~210,000 cubic meters per day. Primary and secondary sludge from all plants are dewatered at the Greenway plant.

The Issue

In Greenway plant has experienced problems related to sludge accumulation in the primaries following snow melts and rain events during the winter and early spring

Our Solution

The sludge removal sequence of the primary clarifiers have been optimized with Valmet TS measurements.

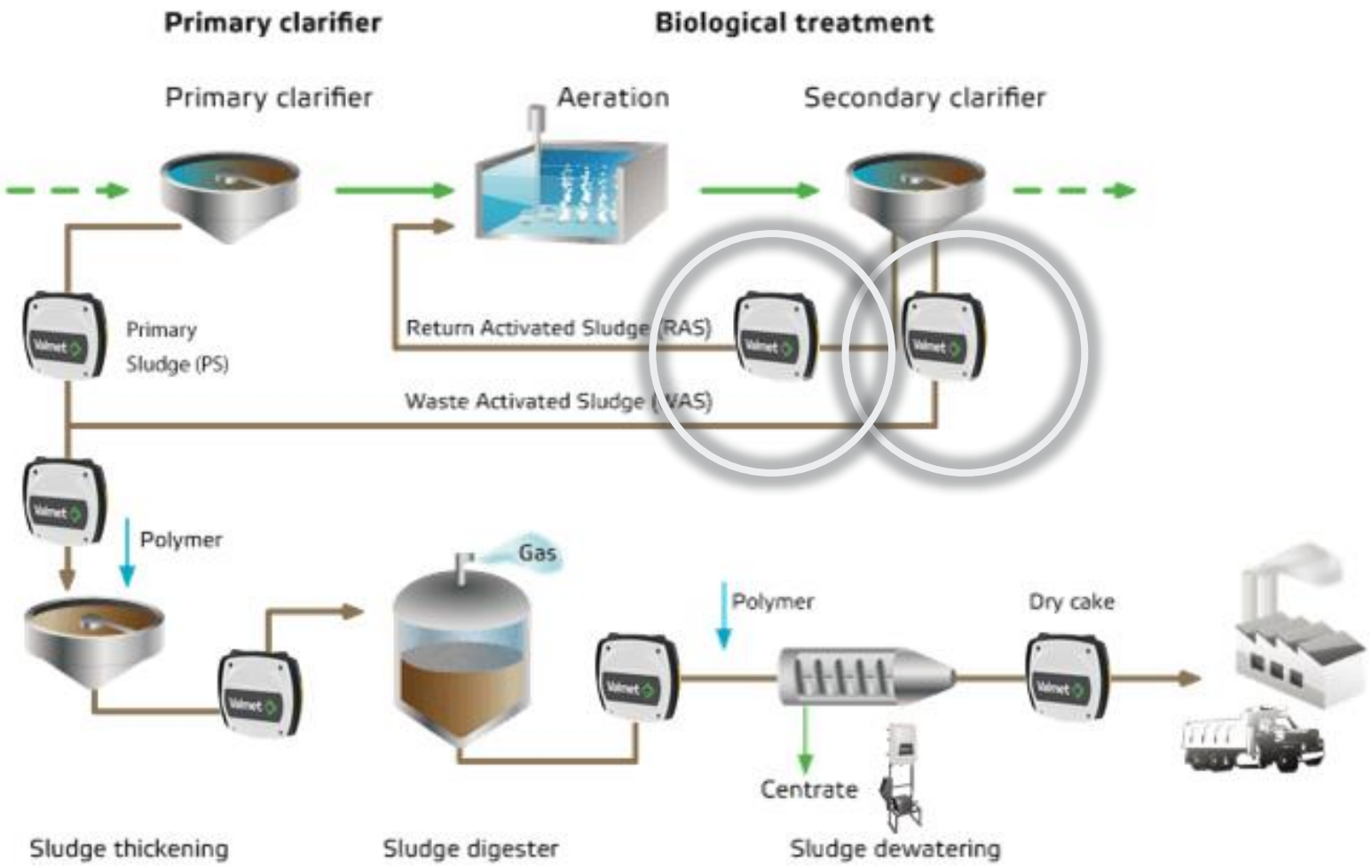
The Results

Online sludge TS measurement helped optimize sludge withdrawal rates and reduced sludge accumulation in the primaries. This led to a reduction in primary clarifier maintenance and improvements in the dewatering and incineration processes.

"Since implementation of the Valmet TS units, there has not been any mechanical breakdown due to heavy sludge buildup. A high trust in measurements."

Mark Spitzig, City of London

Wasting – Based on mass not volume!



Automated Wasting:
Dialing In To An Optimum/Controlled Solids Retention Time

- Target:
  - Match the bacteria population to the amount of food coming into the system (F/M ratio).
- Control:
  - Adjust biomass wasting to maintain desired F/M ratio via SRT algorithm.
  - Amount wasted by the control system is based on biomass not volume.
- Results:
  - Optimum bacteria population.
  - Improved/stable plant effluent.
  - Efficiency & cost reduction.

$$SRT\ (Days) = \frac{Mass\ Under\ Aeration}{Mass\ Wasted\ Per\ Day}$$

$$SRT\ (Days) = \frac{(Aeration\ Basin\ Solids\ Density) * (Basin\ Volume)}{(Wasted\ Solids\ Density) * (Waste\ Flow\ Rate)}$$

$$SRT\ (Days) = \frac{(MLSS) * (Basin\ Volume)}{(WAS\ TSS) * (WAS\ Flow\ Rate)}$$

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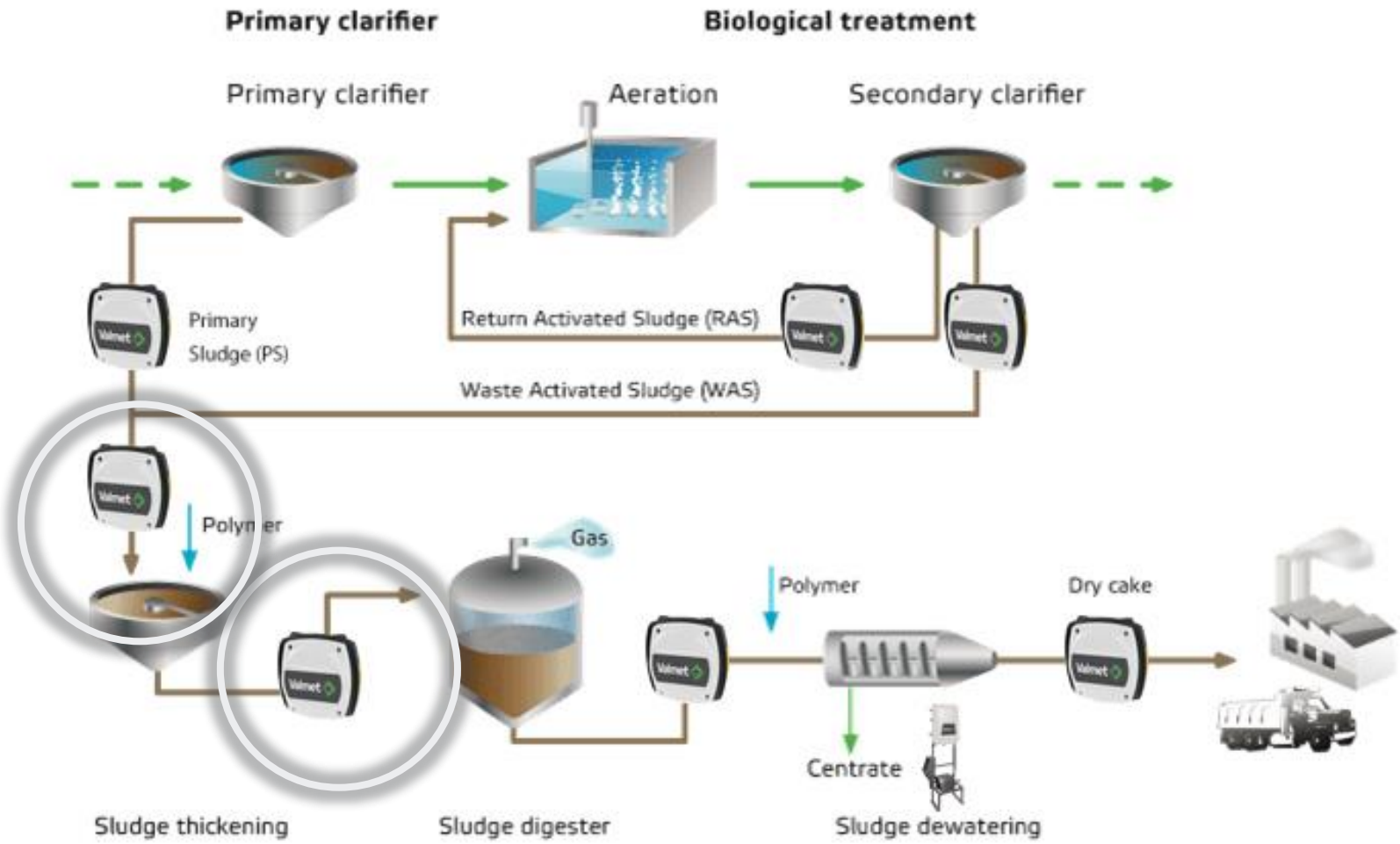
Thickening / Digester feed



Application: Thickening /Digester Feed

- Target
  - maintain optimum sludge solid to digesting process
- Control
  - Polymer dosing control before the thickening process
- Results:
  - Increased sludge digestion time to produce more biogas.
  - Decreased heating energy

Customer Case; Sludge thickening & biogas production optimization
HSY Suomenoja plant, Finland

Background

Helsinki Region Environmental Service Authority (HSY), Suomenoja plant

The plant expanded beyond the original design load years ago. The waste water of over 300,000 inhabitants . This population is growing.

A new central treatment plant is being planned and replaced the existing plant 2020, but capacity of the plant was needed to increases for next coming 10 years

The Issue

"The plant only has about ten years of active working time left, so large investments would not have been reasonable," to increase the capacity of the plant by making the process more efficient.

Our Solution

Manage your mass balance and Improve biogas process efficient with Valmet TS total solids measurement.

The Results

The total solids content of the sludge going into sludge digestion has increased by 10 percent (3.6 % > 4,0 %)

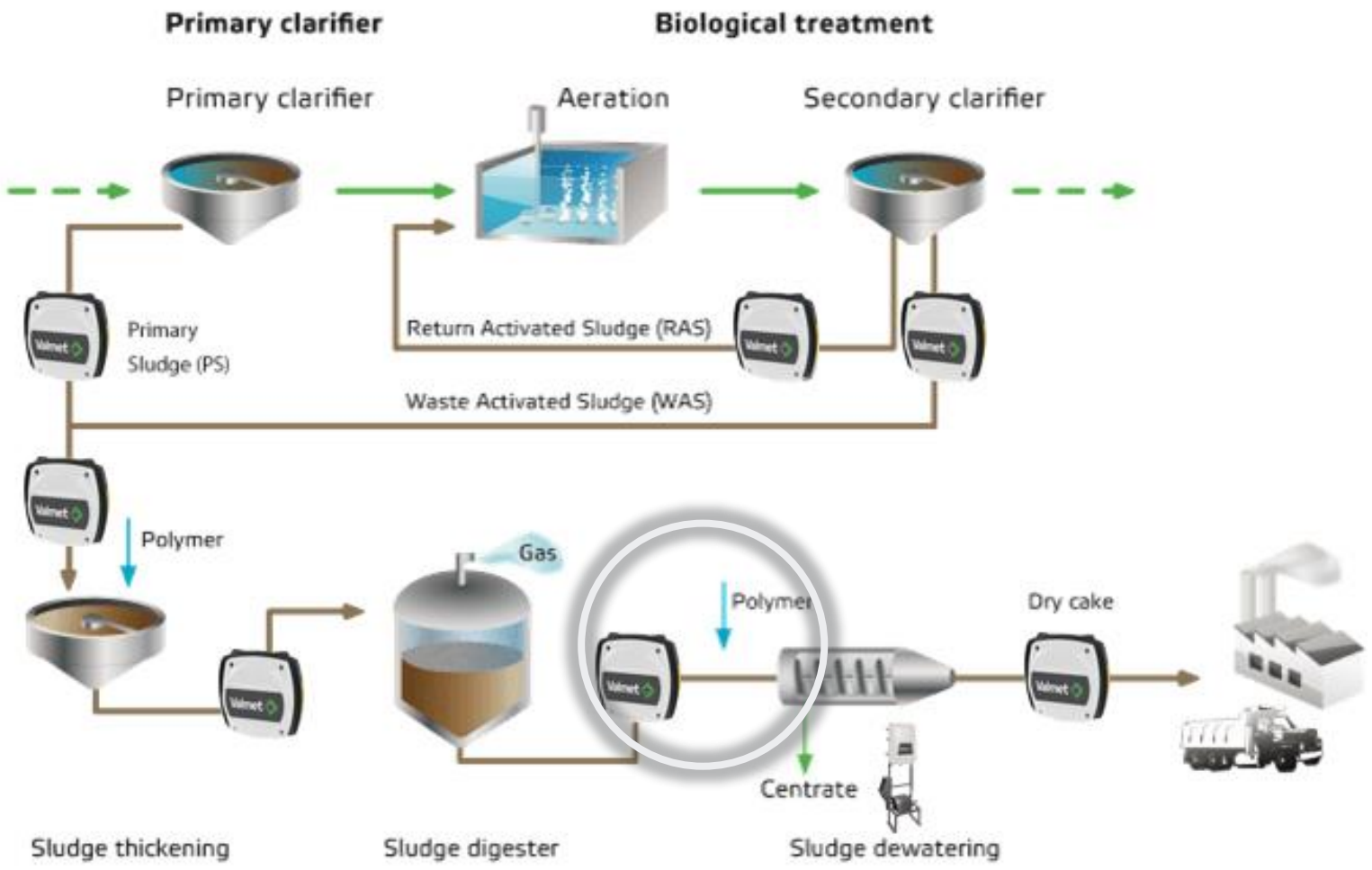
The production of biogas has increased by 8 percent (annually 250,000 m3 of gas equals 25,000 liters of heating oil)

Approximately 10 percent of savings in digestion process heating costs

No disturbances in gas production during the first six months (previously 5-6 disturbances/year)

Jarmo Sundberg,
HSY, Suomenoja wastewater treatment plant

Dewatering

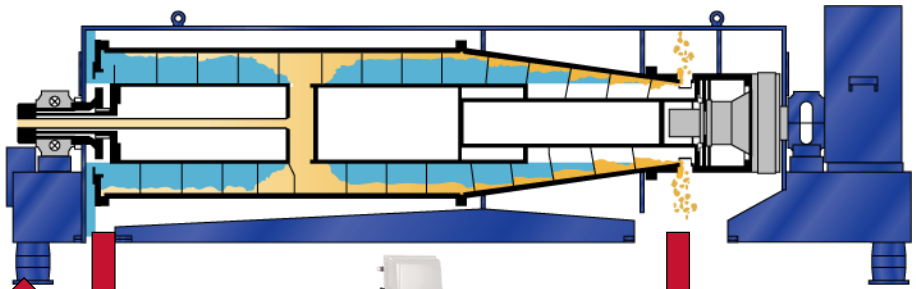


Dewatering

- Target:
  - Accurate measurement for polymer dosage- and dewatering equipments control
- Control:
  - A polymer dosing control
- Results:
  - Reduced polymer costs
  - Stabilized quality of both the dewatered sludge and the centrate water.
  - Reduced sludge transportation costs
  - Improved incineration efficiency when the sludge is burned
  - Lowered energy consumption and maintenance costs of dewatering equipment

Dewatering

Feed sludge ~ 2-6%TS
+ polymer



Centrate water
< 0,1 TS%

Cake solids
~ 25 TS%

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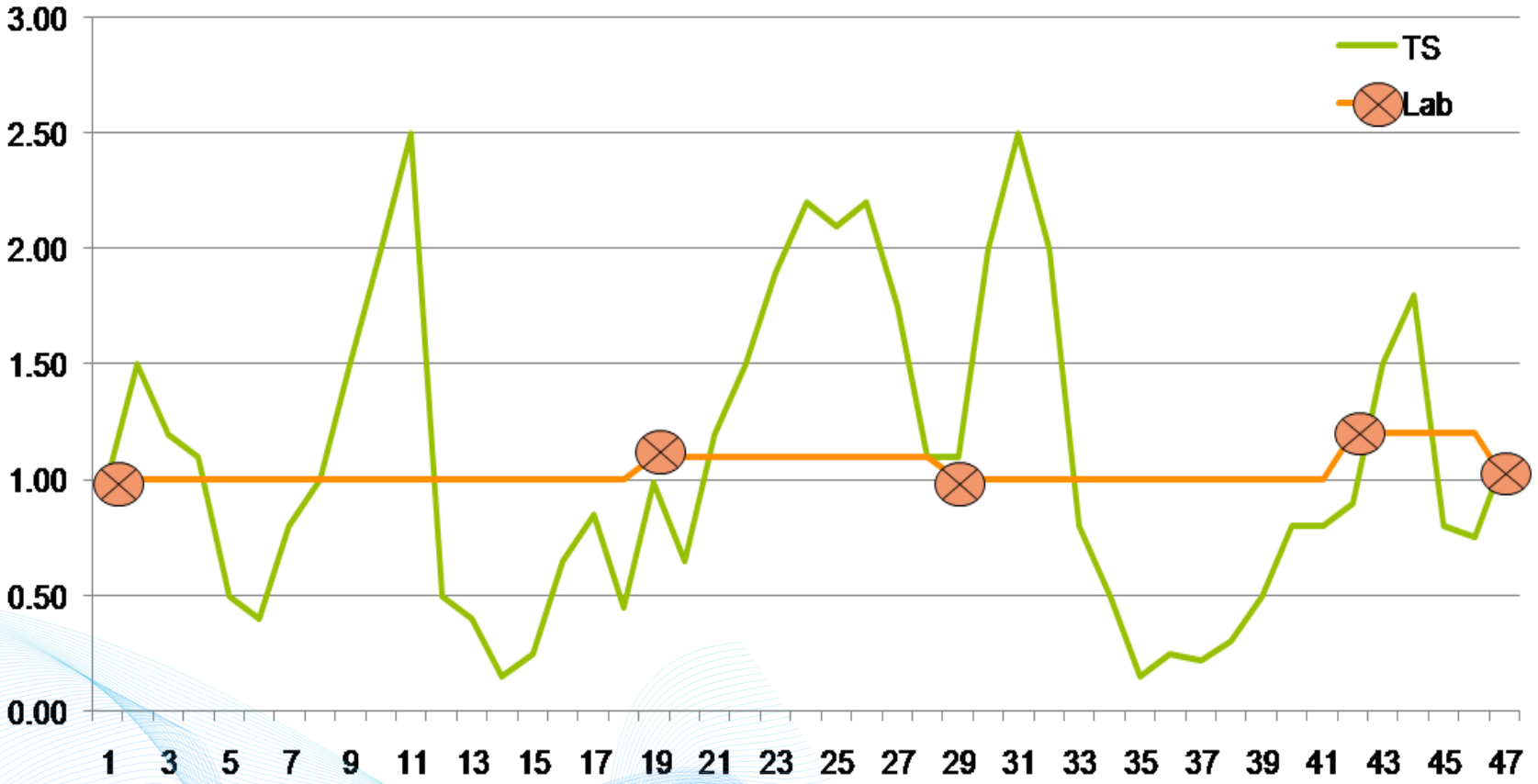
Polymer Dosing using Lab results



OVER 50% POLYMER REDUCTION USING ***valmetTS***

Reduced Polymer Usage

- Pre-kajaaniTS - 389 gpm sludge flow with a polymer dose rate of 1.5 gph
- Post-kajaaniTS - 405 gpm sludge flow with a polymer dose rate of 0.425 gph

Process Improvements and Reduction in Maintenance Costs

- Reduction in Thickener line clogs
- Maintain Floc to Thickeners

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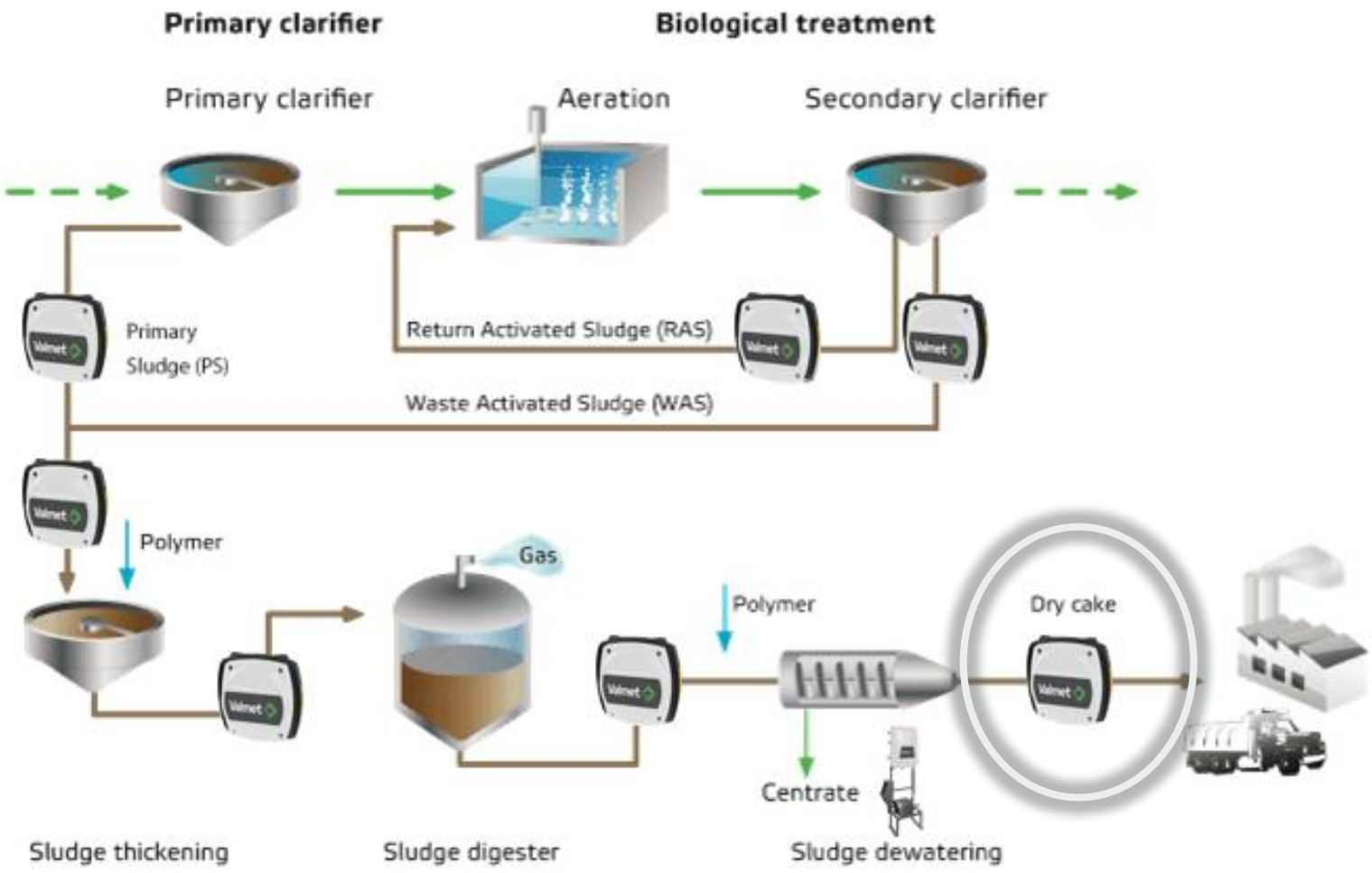
Dewater sludge “Dry Cake” application



Dry Cake (Pumped)

- Target:
  - Accuracy total solids results for dewatering- and incinerator control
- Control:
  - A polymer dosing control
  - Input value for incinerator control
- Results:
  - Efficient combustion of the wastewater solids while maintaining fossil fuel consumption.
  - Operator can proactively adjust the feed rate of both the natural gas and the fuel oil based on the incoming solids of the sludge.
  - Significant energy cost savings.

So, You Don't Pump Your Dry Cake? Don't Give Up. You Can Still Get An Accurate Online Measurement.

Introducing ***valmetDS!!***

Based On The World's Most Proven Microwave Measurement Technology!!

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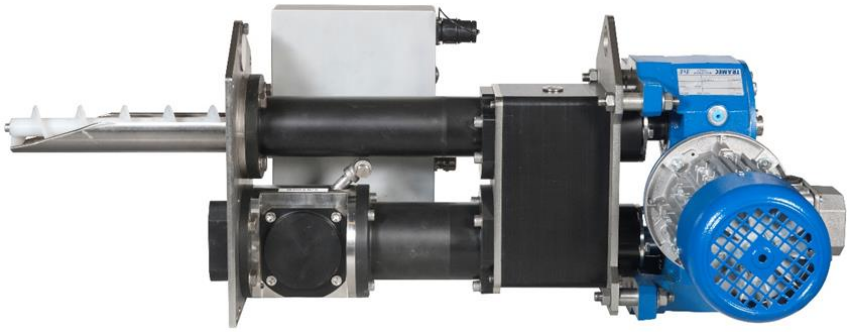
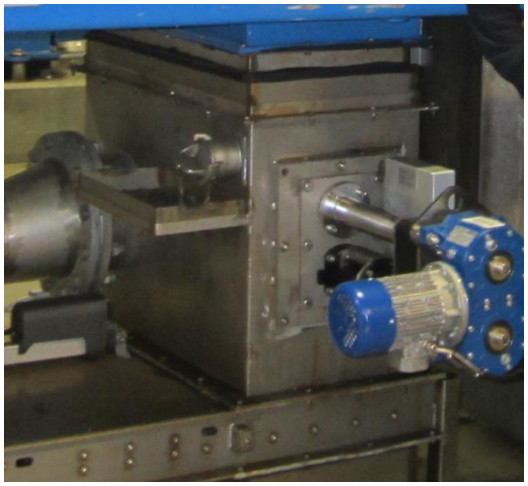
valmetDS – Dry Solids Measurement
Innovation, Accuracy, Reliability

After a centrifuge /screw press

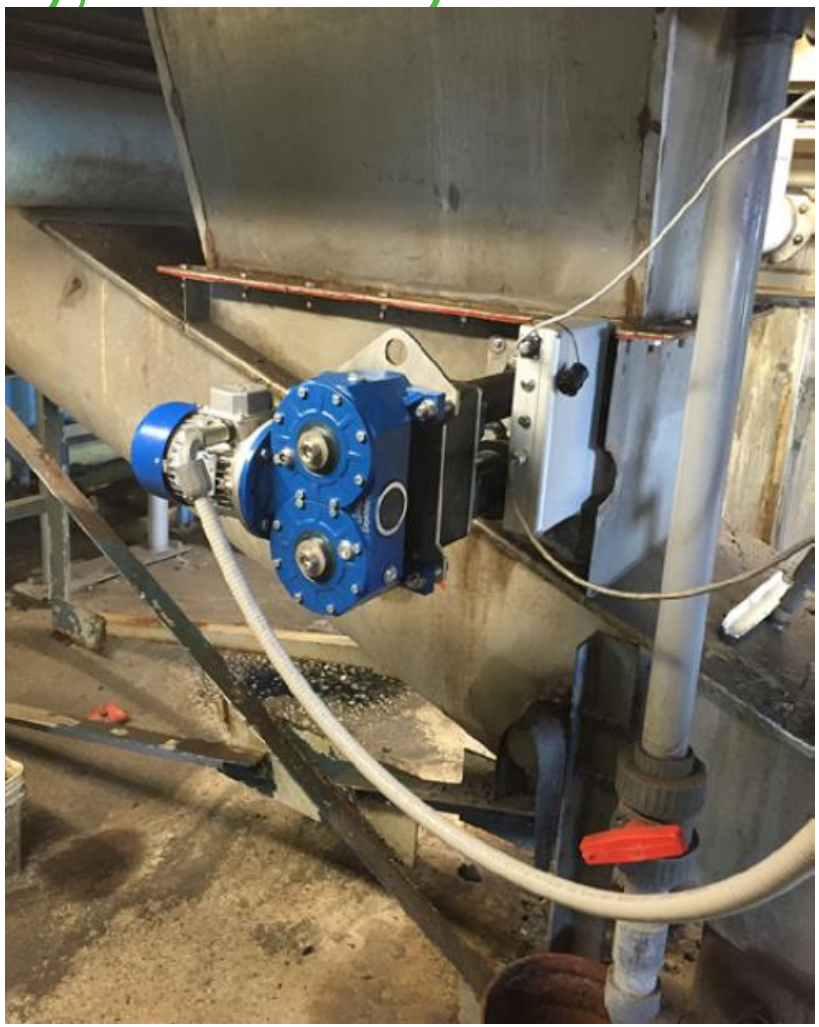
- Measurement is based on **microwave technology** offering stable and accurate solids measurement.
- Measurement range 15 - 35 %
- Continuous sample **from falling cake flow**. After solids content has been measured the unit **returns sample back** to the process.
- It is necessary to monitor solids content in order to control drying process to obtain optimum drying efficiency.





valmetDS – Dry Solids Measurement Innovation, Accuracy, Reliability

- Continuous sample **from falling cake flow**. After solids content have been measured the unit **returns sample back** to the process.



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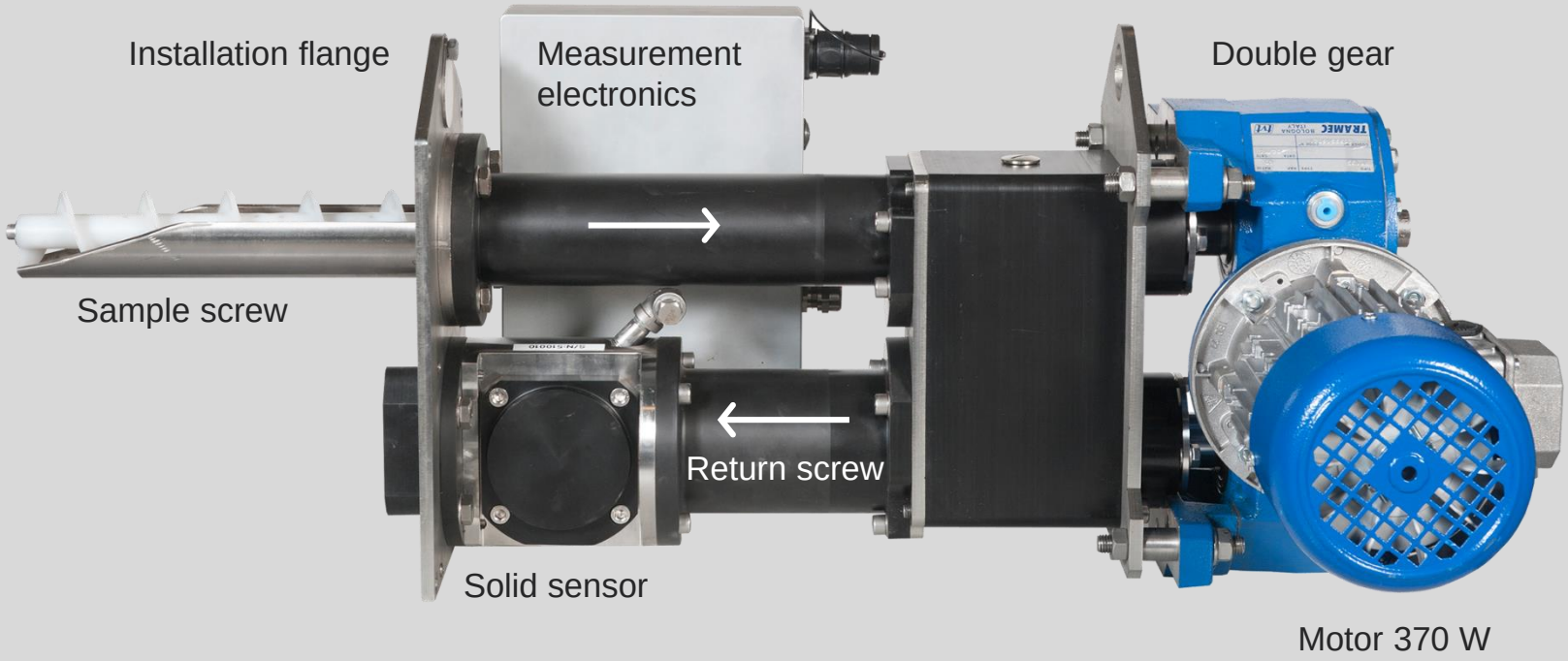
Easy installation

Valmet DS measurement unit

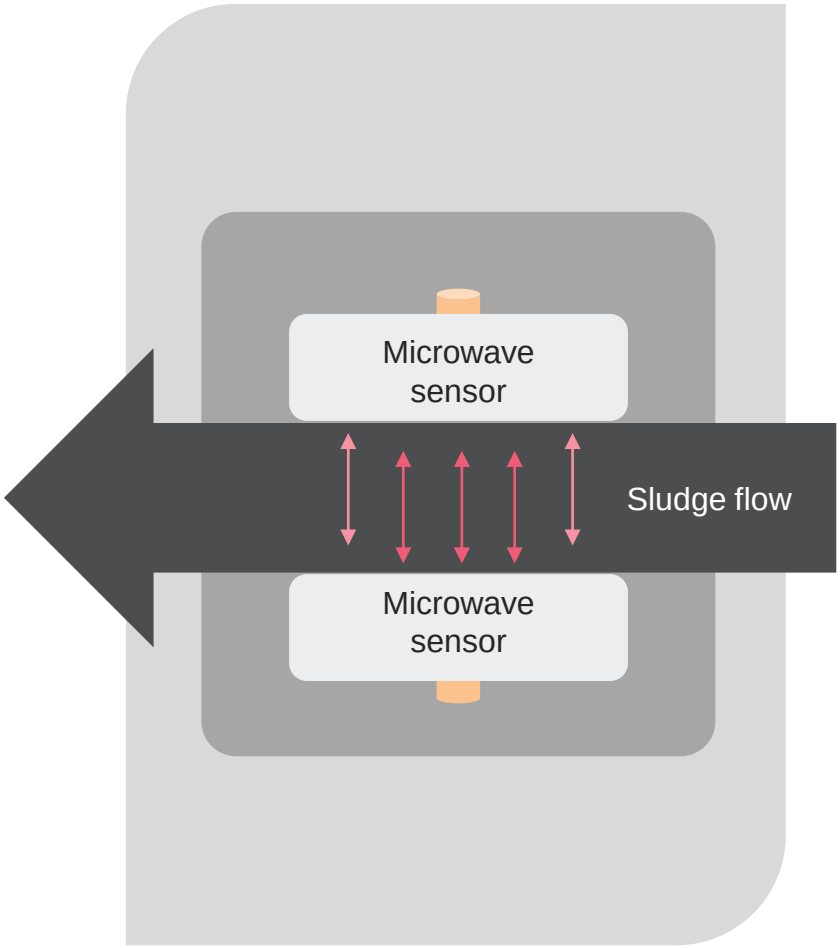
The Valmet DS is installed to a vertical outlet channel where cake falls down to the next conveyor or into a tank.



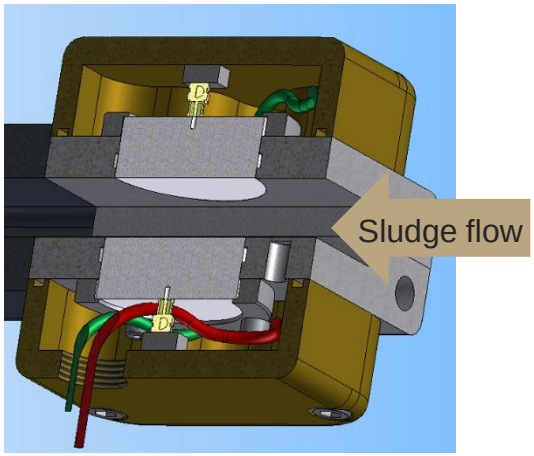
Unique measurement technology

Microwave measurement principle

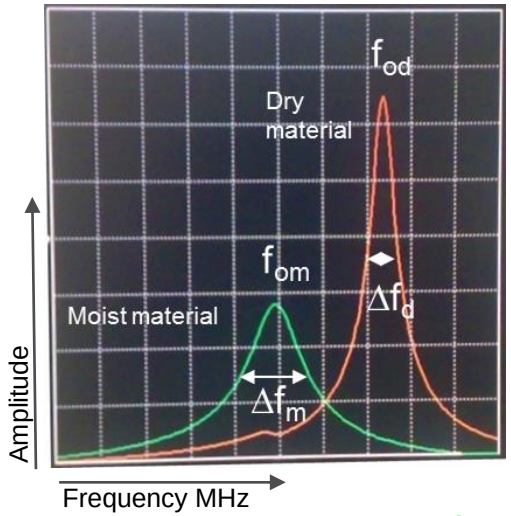
- Sludge is pushed through measurement cavity by screw conveyor
- Air is squeezed out of the sludge prior to measurement
- Microwaves penetrate through sludge and the entire sample is measured
- Water content and density of the sample determine resonance frequency and shape of the measured signal
- Sludge temperature is measured and used for temperature compensation



Measurement principle – Microwave resonance

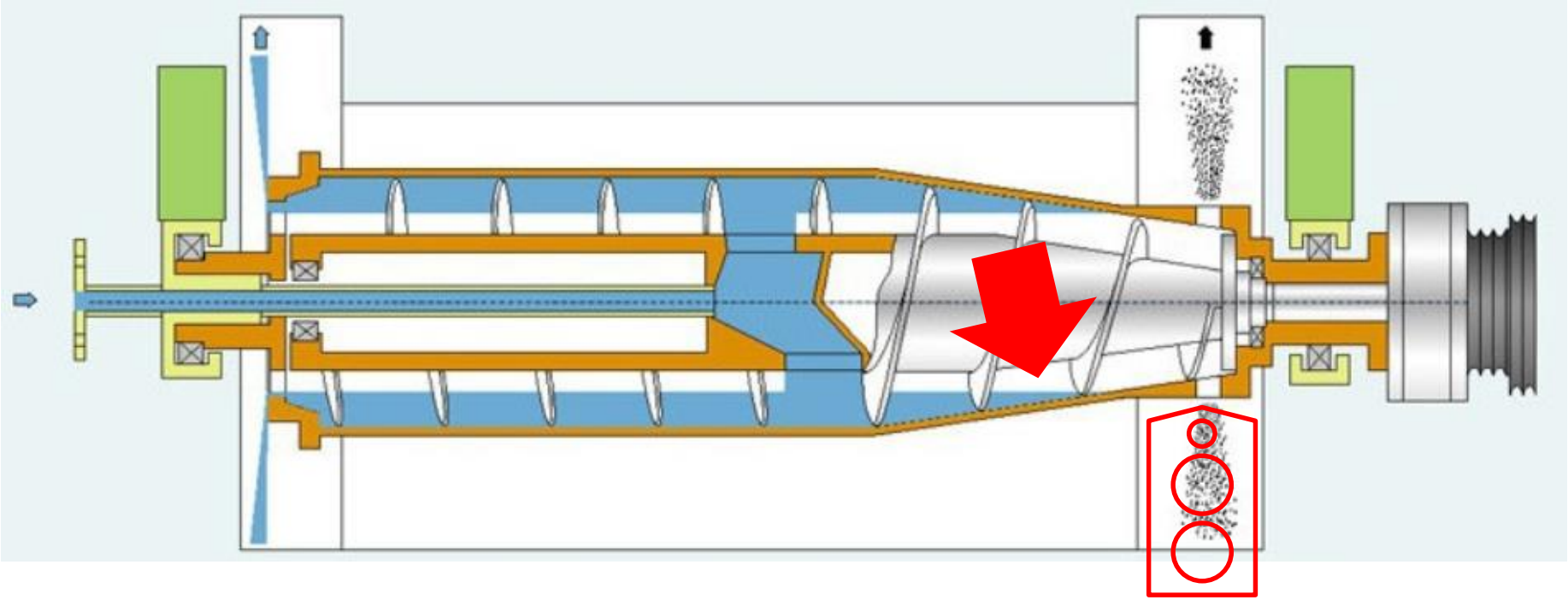


- Sludge is pushed through measurement cavity, air is squeezed out of the sample.
- Microwave signal is created by digital microwave electronics and coupled to ceramic sensor. Electric field covers the whole cavity.
- Water content in sludge determines the resonance frequency and amplitude of measured signal.
- Using these parameters, density compensated TS value is calculated.
- Sludge temperature is measured and used for compensation.
- 100 % safe to people. No special licenses required.
- As water content in the sample increases:
  - Resonance frequency decreases
  - Amplitude decreases



Mechanical installation

- Primary mechanical installation of sampling unit:
  - On flow side of the side of the vertical exit channel.



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Stable and accurate measurements

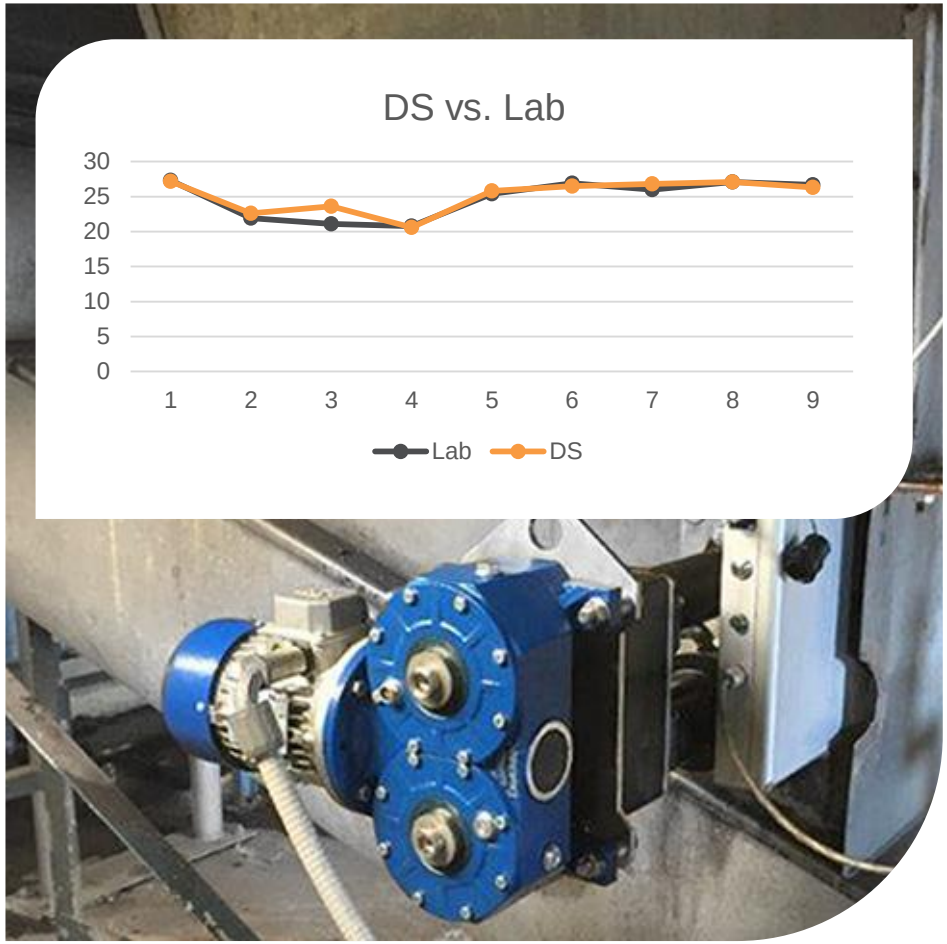
Benefits of dry solids measurements

- Save on polymer through optimizing dosage
- Save on energy through optimizing centrifuge
- Minimize dry cake transportation costs:
  - A municipal plant calculated that 1% increase in dry cake means 4.4% decrease of the total dried sludge amount
  - If 1% increase in dryer cake, $150,000 annually
- Minimize support fuel costs at the combusting plant:
  - An industrial plant calculated that 1% increase in dry cake means $100,000 annually in fuel costs

Measureable results in dry solids

North Carolina, USA

- Valmet DS installed for municipal dried cake solids measurement after a centrifuge
- Polymer reduction
- Improved centrifuge control
- Reduction in fuel costs for incineration



valmetDS – Dry Solids Measurement
Innovation, Accuracy, Reliability

- Real time, continuous cake measurement based on microwave resonance technology for robust feedback control.

- The right tool to improve:
  - Polymer Reduction!
  - Centrifuge Torque and Differential Speed Control!
  - Pond Depth Adjustment!
  - Cake Moisture Reduction!
  - Product Uniformity!
  - Efficiency & Savings!


Valmet
FORWARD