CENTROPROJEKT DO BRASIL

04 - 06 OUTUBRO 2010

TRANSAMERICA EXPO CENTER
SÃO PAULO - BRASIL

Optimizing Effluent and Sludge Treatment for Kraft Pulp Mills with regards to Energy Production, Consumption and Carbon Footprint.

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ABTCP-TAPPI 2010
43º CONGRESSO E EXPOSIÇÃO INTERNACIONAL DE CELULOSE E PAPEL

43º Congresso e Exposição Internacional de Celulose e Papel

43rd Pulp and Paper International Congress & Exhibition

ABTCP

TAPPI

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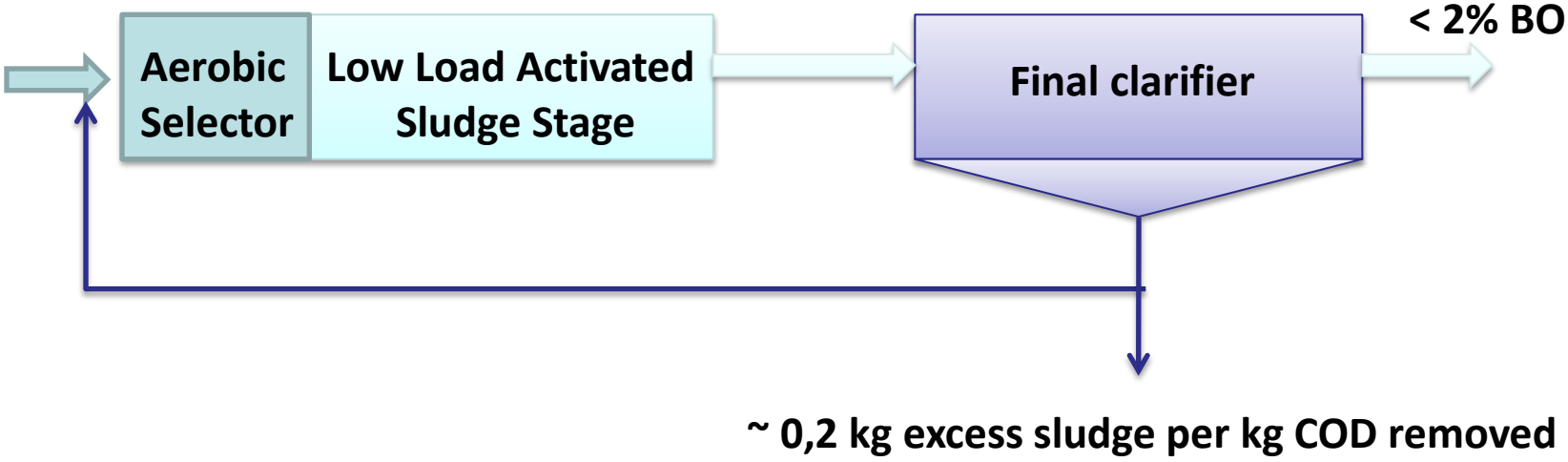

- f/m ratio: 0,1 kg BOD / kg MLSS - day
- BOD vol. loading: 0,5 kg BOD / m³ - day
- Sludge age: 18 - 24 days
- Total HRT: 35 hours

FIBRIA – Três Lagoas and VERACEL

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Attisholz - 2 Stage Process

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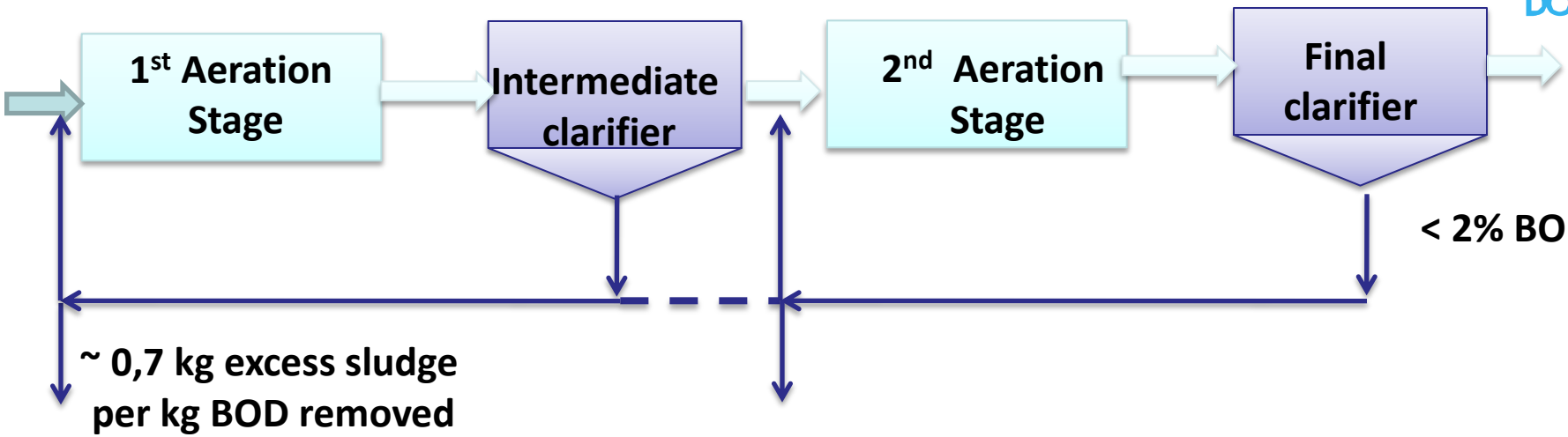
100% BOD in



1st stage

- f/m ratio: 0,2 kg BOD/kg MLSS -day
- BOD vol. loading: 3,4 kg BOD/ m³ - day
- Sludge age: 3 – 5 days
- BOD removal: 80%

2nd stage

- f/m ratio: 0,2 BOD/kg MLSS - day
- BOD vol. loading: 0,8 kg BOD/ m³ - day
- Sludge age: 8 -15 days
- BOD removal: > 80%

- Total HRT: 18 hours

IP Luiz Antonio Effluent Treatment plant

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Process Operation

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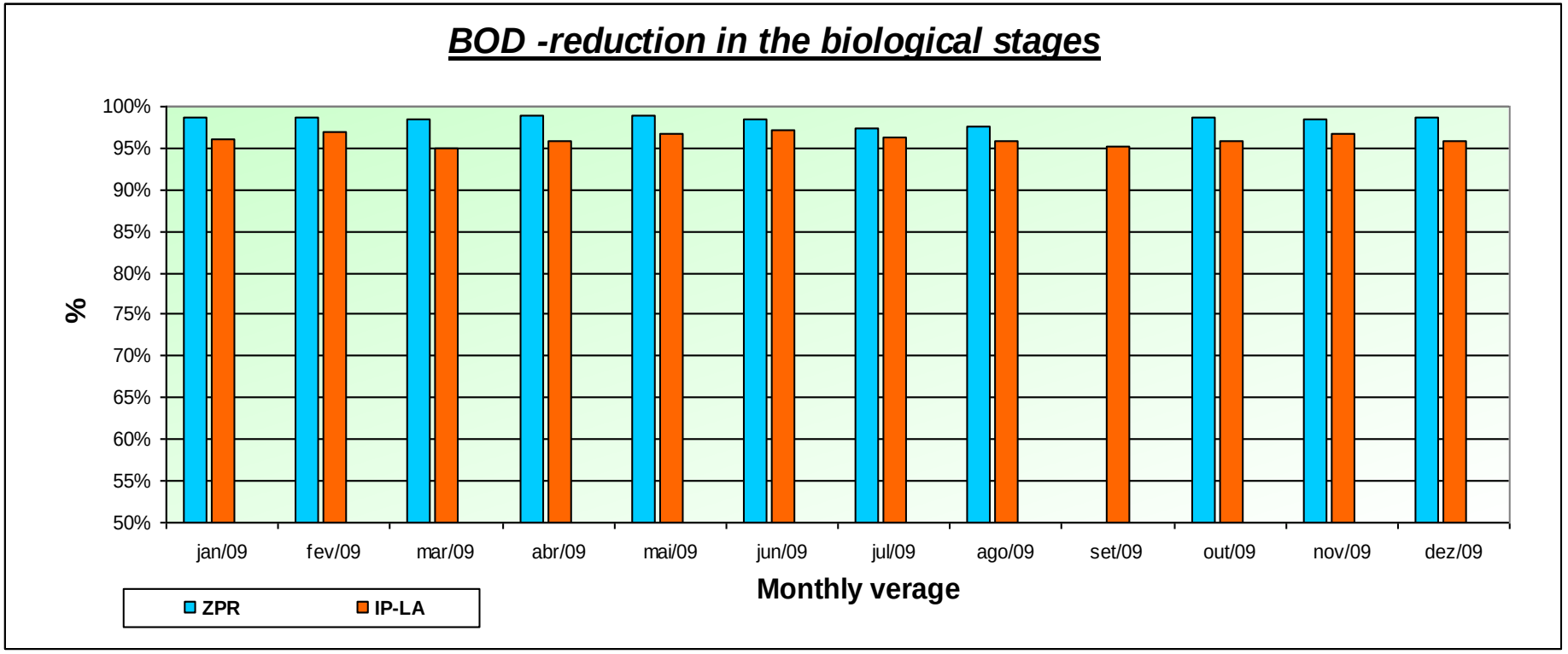

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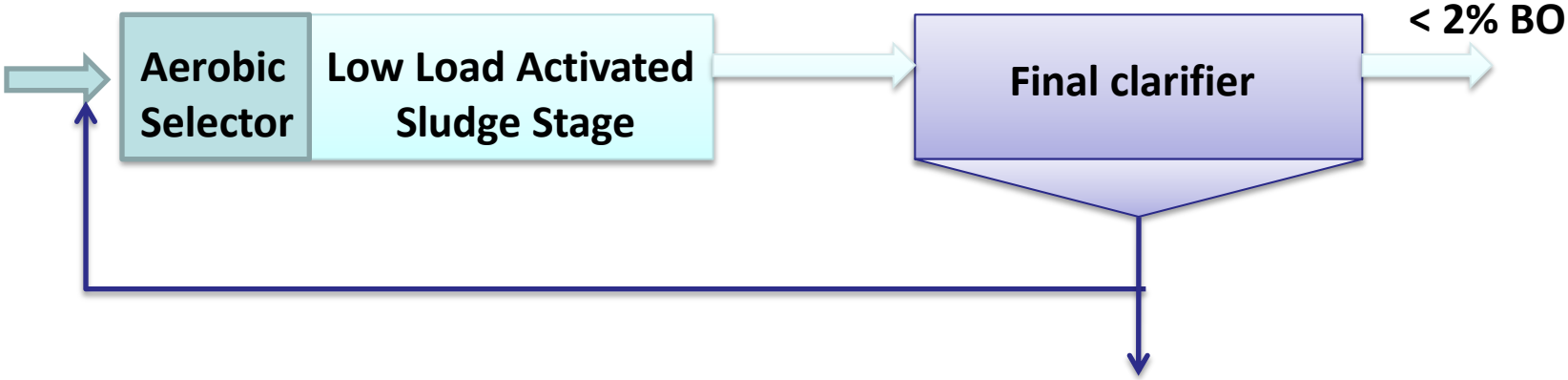

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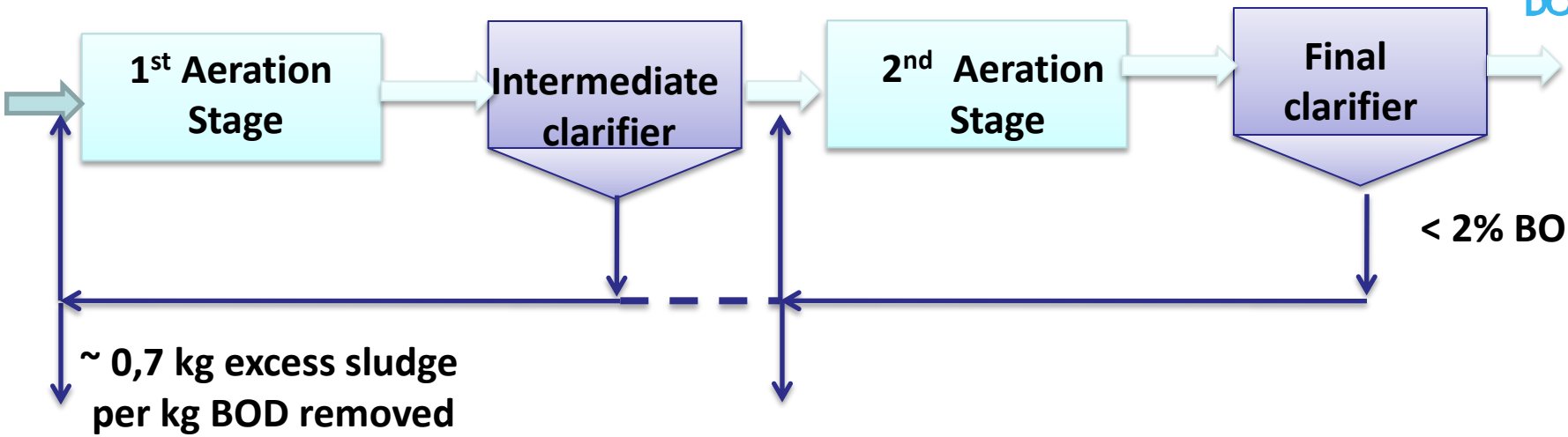

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Flow and Load Comparison

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		SCENARIOS			
		Greenfield		Greenfield	
Treatment process	-	**2 Stage Attischolz Process**		**Selectar**	
Sludge handling	-	**anaerobic digestion, dewatering**		**simultaneous aerobic stabilization and dewatering**	
		I	**Daily load or Unitary rate**	**II**	**Daily load or unitary rate**
Flowrate	m³/d	148.800		148.800	
BOD inlet	mg/L	411	61.200	411	61.200
Air flow	Nm³/h @ 9m depth	46.500		82.000	
Blower´s consumed power	kW	1.500		2.625	
Reactor volume (1st STAGE + 2nd STAGE)	m³	46.000		120.000	
Total "Biological" Volume = Reactors and Settlers	m³	133.745		176.745	
Total "Biological" Volume = Reactors and Settlers including Anaerobic Digester	m³	143.498		176.745	
Total HRT (including biological settlers)	h	17,7		28,5	
Excess sludge production	kgTSS/d	40.637		24.500	
	kgVSS/d	31.000		18.375	

Statements

1. Biomass contains energy!
2. From biomass we can produce primary energy!
3. Why biodegrade biomass using a lot of energy if we can use it for better purposes?

Typical uses of the Excess sludge

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1. Do simultaneous stabilization = oxidation;
2. Landfill the dewatered sludge;
3. Direct use in foresting;
4. Compost the sludge with other waste material to produce a sellable fertilizing humus replacement / soil improver;
5. Burn it i.e. in the biomass boiler;
6. Produce primary energy from the biomass in anaerobic digestion;

Sludge is valuable

1. Biomass is valuable.
2. Organic fraction in the sludge and the N and P content.
3. The value of sludge can be different.

Excess sludge production
Oxygen required

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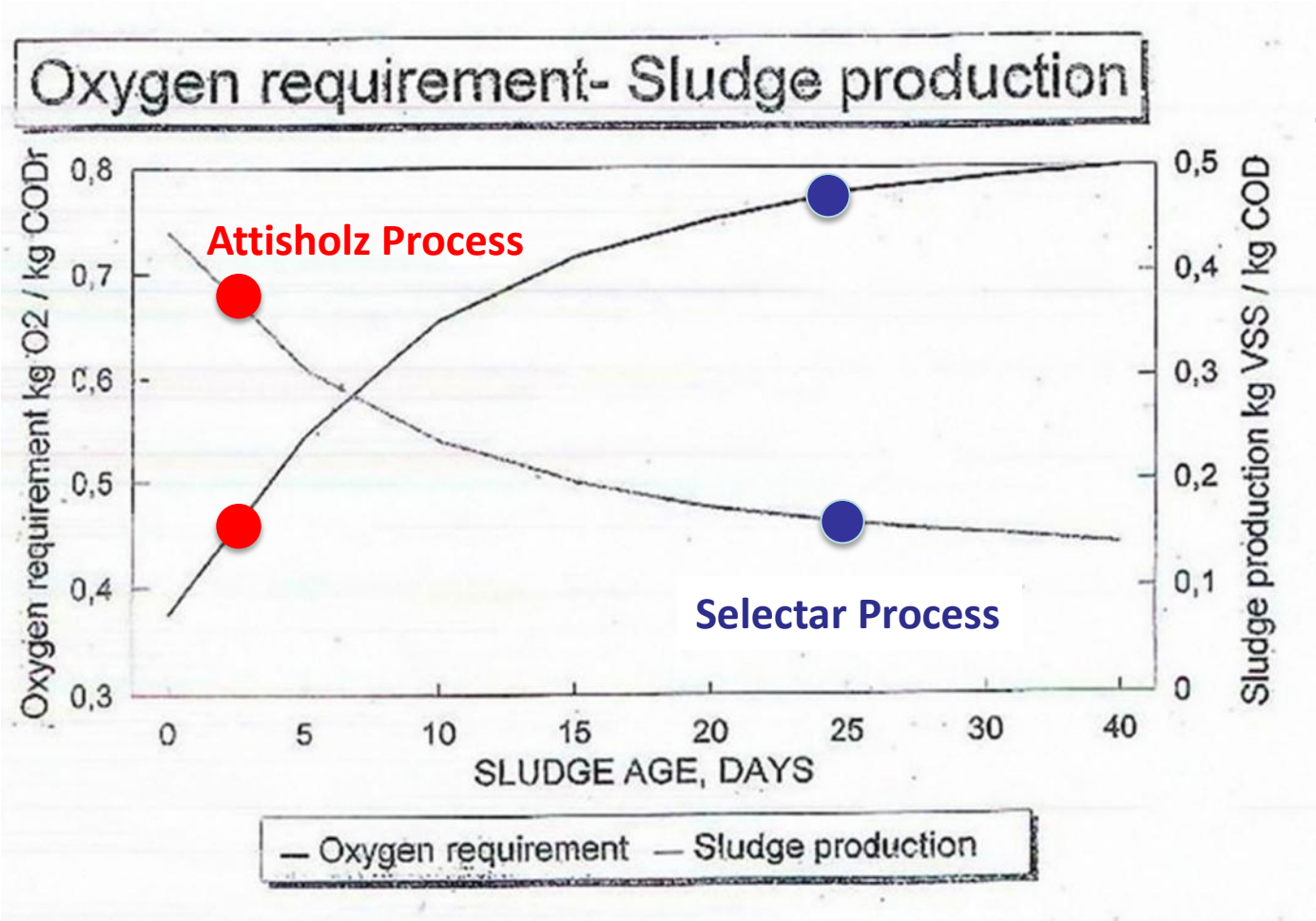
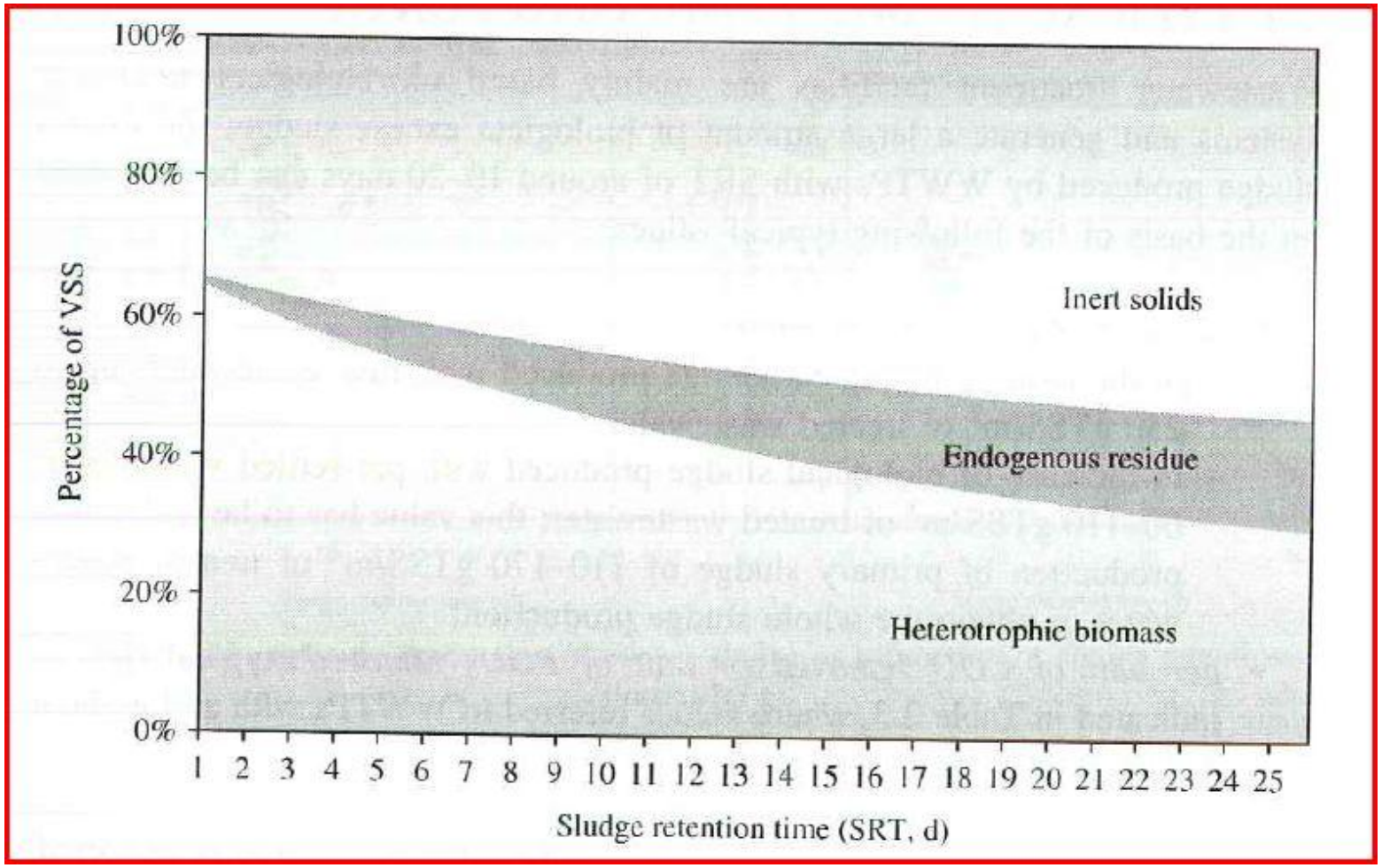


Value of the sludge



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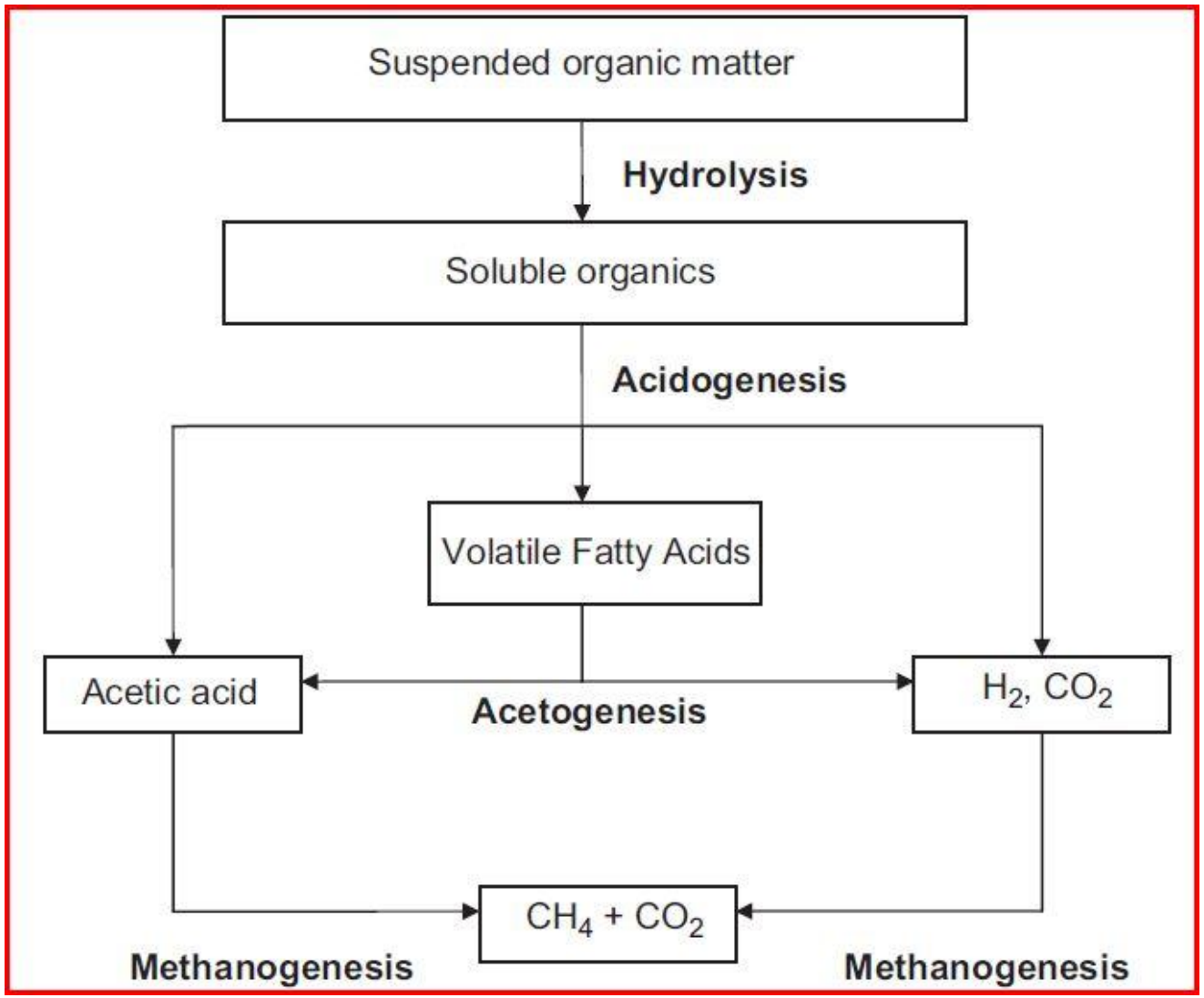
Anaerobic digestion and the four steps



Anaerobic Digestion Plant

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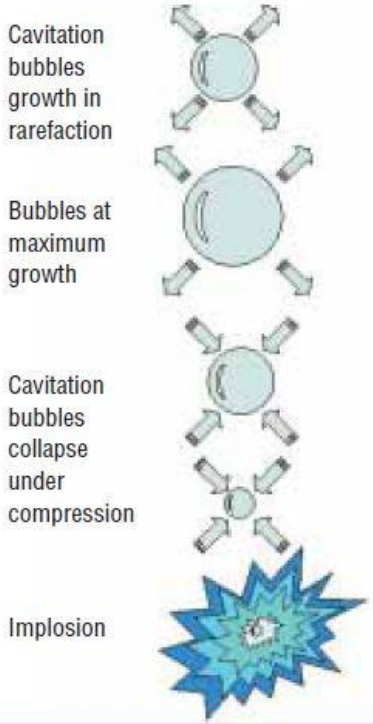
Cell disintegration techniques

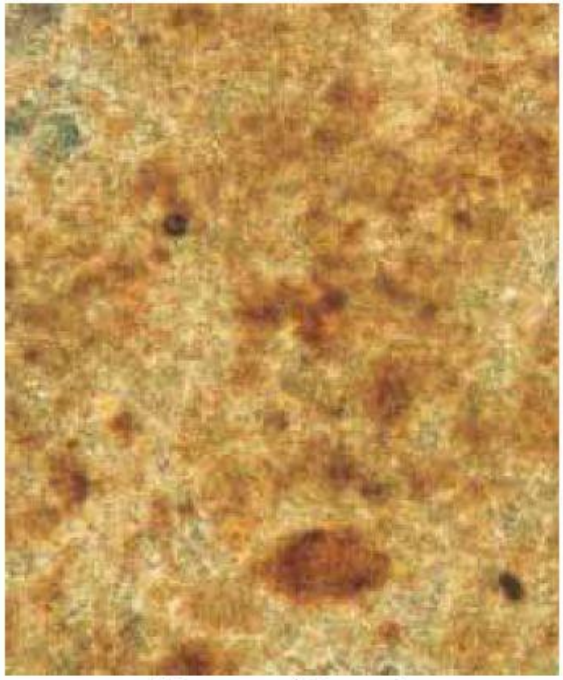
1. Working with thermophilic temperatures (> 50º C);
2. By mechanical disintegration with centrifuges;
3. Biological, using enzymes;
4. Thermal disintegration using high temperature (> 150º C) and pressure;
5. Ultrasonic pretreatment.
6. Others

Ultrasound process

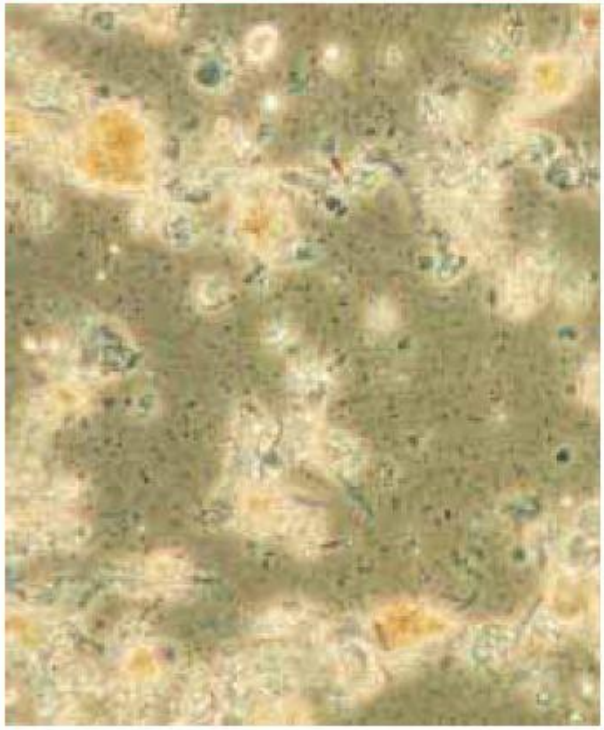
Ultrasound Cavitation Schematic



Ultrasound Disintegration of 6% Waste Activated Sludge

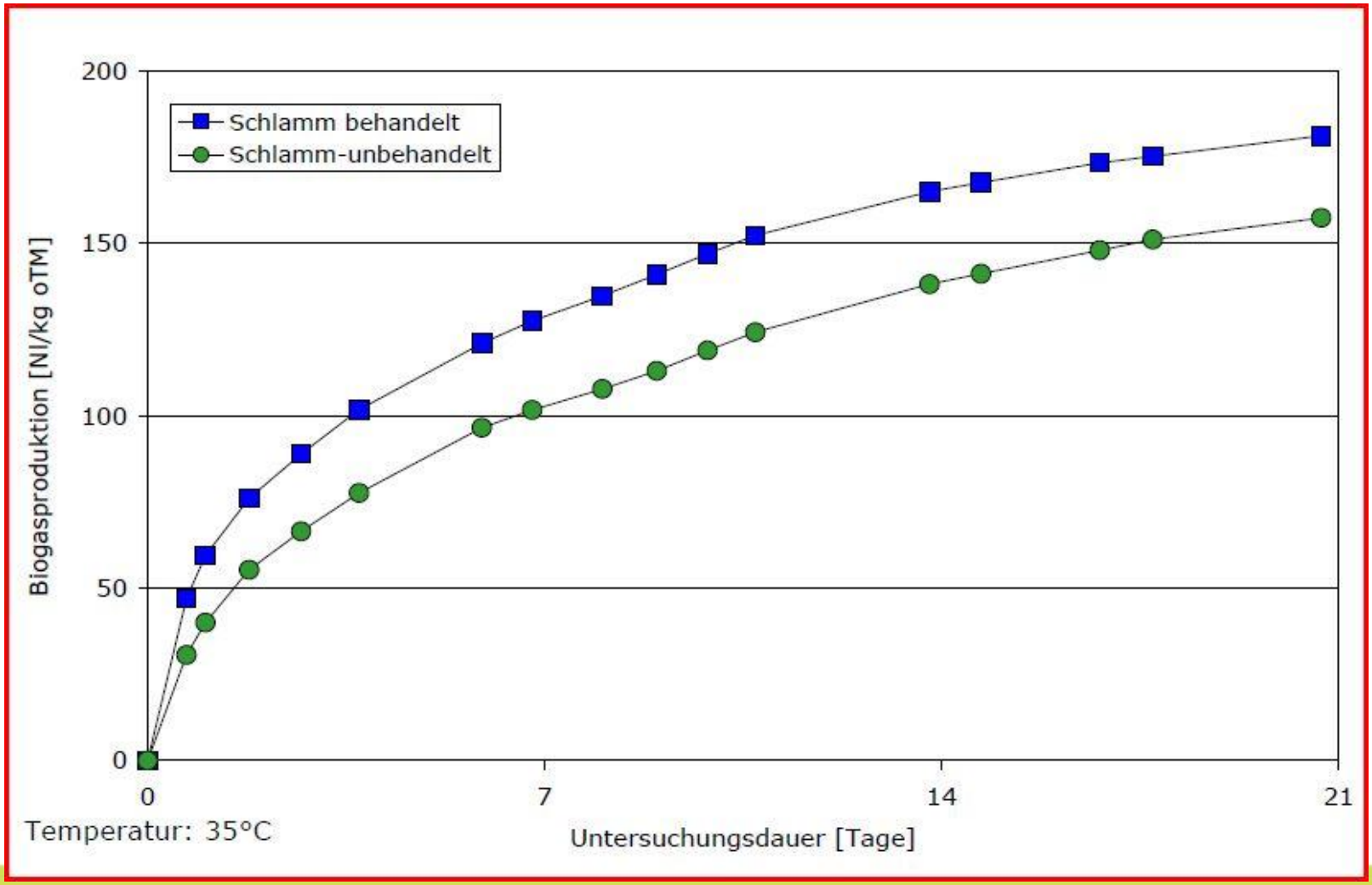


Untreated Sample



Ultrasound Treated Sample

Test results Hamburg



ETE ZPR/Rosenthal and first stage Attisholz process

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Ultrasound pilot plant container

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Ultrasound pretreatment

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The 5 reactors

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The reactor top with gas counter

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Final values considering biogas and sludge reduction after anaerobic digestion

		SCENARIOS	
		Greenfield	Greenfield
Treatment process	-	2 Stage Attischolz Process	Selectar
Sludge handling	-	anaerobic digestion, dewatering	simultaneous aerobic stabilization and dewatering
		I	II
Sludge before digestion	kgTSS/d	40.637	
	kgVSS/d	31.000	
Sludge after digestion	kgTSS/d	25.137	
	kgVSS/d	15.500	
Digester volume 12 days	m3	9.753	
Biogas production	Nm^3/d	10.850	
CH_4 production	Nm^3CH4/d	7.053	
Chemical energy	kCal/day	59.675.000	
Electrical energy production	kWh/d	20.817	
Energy consumption for sonication	kWh/d	3.440	
Energy for mixing and pumps	kWh/d	2.856	
Net energy gain	kWh/d	14.521	
Net Blower´s consumption (-) electric energy gain from biogas	kWh/d	895	2.625
Sludge concentration - dewatering	%	25%	15%
Sludge production after dewatering unit	ton/d	100,5	122,0

Conclusions

Combining the ATTISHOLZ process with Anaerobic Digestion gets us:

- Less energy for the biological treatment
- Less sludge to dispose of
- Additional energy from biogas
- Lower carbon footprint
- Better P-removal
- Smaller plant footprint

Have another look at your sludge concepts