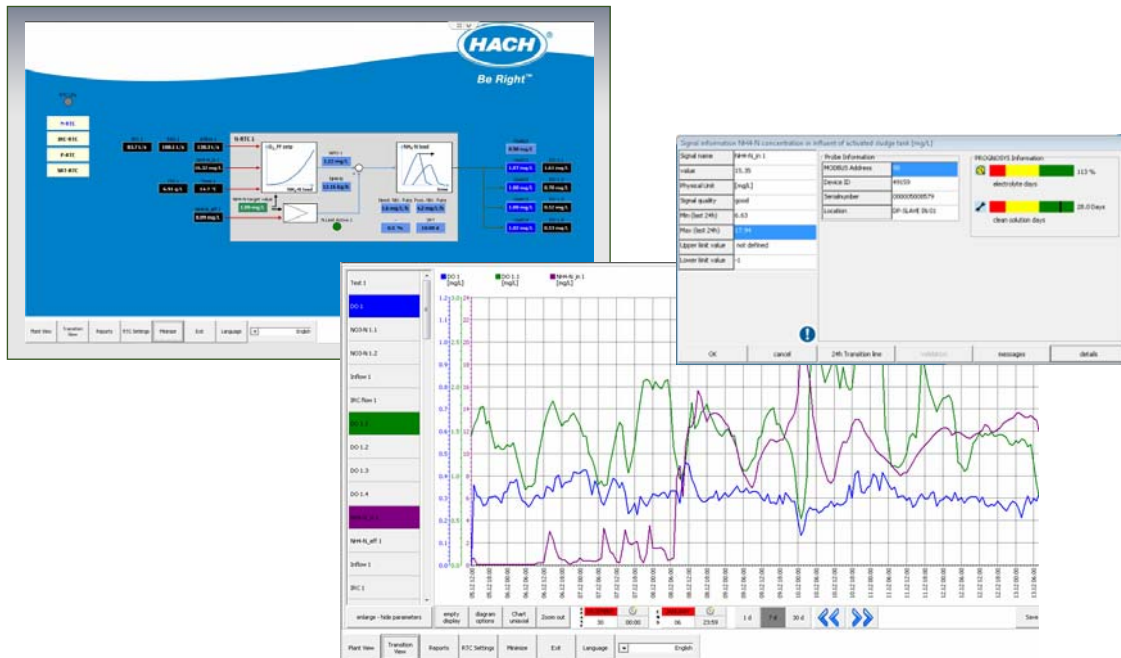




Process Management

Real Time Control Modules
for Biological Waste Water Treatment
- Product Range and Description -



RTC Standardized Combined Product Range

Process	Product description		Abbreviation	Article #
PO4-P precipitation (RTC-P)	Closed loop control PO4, Output: precipitant flowrate	1 Channel 2 Channel	RTC-P_CL (1C) RTC-P_CL (2C)	LXZ515.99.A1010 LXZ515.99.A1011
	Open loop control PO4, Output: precipitant flowrate	1 Channel 2 Channel	RTC-P_OL (1C) RTC-P_OL (2C)	LXZ515.99.A1110 LXZ515.99.A1111
	Closed loop control PO4 considering P_tot / TSS in effluent, Output: precipitant flowrate	1 Channel	RTC-P_OLCL	LXZ515.99.A1210
	Combination open / closed loop control PO4, Output: precipitant flowrate	1 Channel 2 Channel	RTC-P_OLCL (1C) RTC-P_OLCL (2C)	LXZ515.99.A1310 LXZ515.99.A1411
	Closed loop PO4 control, Output: precip. flowrate 1 combined with open loop PO4 control, Output: precip. flowrate 2	2 Channel	RTC-P_CLOL	LXZ515.99.A1311
Intermittent denitrification (RTC-N/DN)	Intermittent aeration control, Output: Aeration on/off	1 Channel 2 Channel	RTC-N/DN (1C) RTC-N/DN (2C)	LXZ520.99.C0101 LXZ520.99.C0111
	Intermittent aeration & O2 control, Output: Aeration on/off, 1 aeration stage, VSD	1 Channel 2 Channel	RTC-N/DN_DO (1C) RTC-N/DN_DO (2C)	LXZ520.99.C3101 LXZ520.99.C3111
	Intermittent aeration & O2 control, Output: Aeration on/off, 6 aeration stages, 2 VSD	1 Channel 2 Channel	RTC-N/DN_DO 2VSD (1C) RTC-N/DN_DO 2VSD (2C)	LXZ520.99.C2101 LXZ520.99.C2111
SBR (Intermittent denitrification) (RTC-N/DNSBR)	Intermittent aeration control (SBR), Output: Aeration on/off	1 Channel 2 Channel	RTC-N/DN SBR (1C) RTC-N/DN SBR (2C)	LXZ520.99.D0101 LXZ520.99.D0111
	Intermittent aeration & O2 control (SBR), Output: Aeration on/off, 1 aeration stage, VSD	1 Channel 2 Channel	RTC-N/DN SBR_DO (1C) RTC-N/DN SBR_DO (2C)	LXZ520.99.D3101 LXZ520.99.D3111
	Intermittent aeration (SBR) & O2 control, Output: Aeration on/off, 6 aeration stages, 2 VSD	1 Channel 2 Channel	RTC-N/DN SBR_DO 2VSD RTC-N/DN SBR_DO 2VSD	LXZ520.99.D2101 LXZ520.99.D2111
Simultaneous denitrification (RTC-SND)	NH4 & NO3 control, Output: Aerated volume (0...100%)	1 Channel 2 Channel	RTC-SND (1C) RTC-SND (2C)	LXZ522.99.A0101 LXZ522.99.A0111
	NH4 & NO3 control, Output: Aerated volume (0...100%), Output: 6 stages, 2 VSD	1 Channel 2 Channel	RTC-SND (1C6Z) RTC-SND (2C6Z)	LXZ522.99.B0101 LXZ522.99.B0111
Nitrification, plug flow (RTC-N)	Combination open / closed loop NH4 control, Output: O2 setpoint	1 Channel 2 Channel	RTC-N-RTC (1C) RTC-N-RTC (2C)	LXZ519.99.B0101 LXZ519.99.B0111
	Combination open / closed loop NH4 control, Output: Aeration on/off, 1 aeration stage, VSD	1 Channel 2 Channel	RTC-N_DO (1C) RTC-N_DO (2C)	LXZ519.99.B3101 LXZ519.99.B3111
	Combination open / closed loop NH4 control, with O2 control, Output: O2 setpoint, 6 aeration stages, 2 VSD	1 Channel 2 Channel	RTC-N_DO 2VFD (1C) RTC-N_DO 2VFD (2C)	LXZ519.99.B2101 LXZ519.99.B2111
	Combination open / closed loop NH4 control, Output: O2 setpoints for 4 zones, control of one swing zone	1 Channel 2 Channel	RTC-N_4Z (1C) RTC-N_4Z (2C)	LXZ519.99.D0101 LXZ519.99.D0111
	Combining open / closed loop NH4 control on Step Feed reactors, Output: O2 set points for 3 zones	1 Channel 2 Channel	RTC-N_STEP (1C) RTC-N_STEP (2C)	LXZ519.99.D1101 LXZ519.99.D1111
DO control (RTC-DO)	Closed loop zone DO control. Output: Aeration intensity	4 valves	RTC-DO (4C)	LXZ530.99.C0101
		8 valves	RTC-DO (8C)	LXZ530.99.D0101
		12 valves	RTC-DO (12C)	LXZ530.99.C0111
		16 valves	RTC-DO (16C)	LXZ530.99.D0111
Most open valve DO control (RTC-MOV)	Closed loop zone DO control. Output: Air valve position, pressure on manifold or overall	4 valves	RTC-MOV (4C)	LXZ530.99.A0101
		8 valves	RTC-MOV (8C)	LXZ530.99.B0101
		12 valves	RTC-MOV (12C)	LXZ530.99.A0111
		16 valves	RTC-MOV (16C)	LXZ530.99.B0111
Denitrification (RTC-DN)	Closed loop control NO3 effluent anoxic or aeration. Output: Internal recirculation	1 Channel 2 Channel	RTC-DN_IRC (1C) RTC-DN_IRC (2C)	LXZ521.99.A0101 LXZ521.99.A0111
	Closed loop control NO3 effluent denitrification or effluent aeration. Output: Internal recirculation and external carbon	1 Channel 2 Channel	RTC-DN_IRC_C (1C) RTC-DN_IRC_C (2C)	LXZ521.99.B0101 LXZ521.99.B0111
	Combination open / closed loop NO3-N control. Output: External carbon flow	1 Channel 2 Channel	RTC-DN_C (1C) RTC-DN_C (2C)	LXZ514.99.B0101 LXZ521.99.D0111
Nutrient dosing (RTC-C/N/P)	Organic load based nutrient dosing combined with effluent nutrient control. Output: External Nitrogen and Phosphorous dosing rate	1 channel 2 channel	RTC-C/N/P (1C) RTC-C/N/P (2C)	LXZ514.99.B0101 LXZ514.99.B0111
Sludge retention time (RTC-SRT)	Adjustment of sludge retention time according to temperature. Output: Surplus activated sludge flow rate	1 Channel 2 Channel	RTC-SRT (1C) RTC-SRT (2C)	LXZ518.99.A0101 LXZ518.99.A0111
Chlor-Dechlor (CL2-RTC)	Closed loop adjustment of Total Residual Chlorine (TRC) after waste water disinfection. Output: CL2 dosing and dosing of de-Cl compound	1 Channel 2 Channel	RTC-CL2 (1C) RTC-CL2 (2C)	LXZ531.99.A1010 LXZ531.99.A1011
Sludge Thickening (RTC-ST)	Open and closed loop contr. of TSS in thickened sludge and/or filtrate. Output: Polymer flow and/or feed flow	1 Channel	RTC-ST (1C)	LXZ517.99.A0101
		2 Channel	RTC-ST (2C)	LXZ517.99.A0111
Sludge dewatering (RTC-SD)	Control of TSS in dewatered sludge or centrate: Output: Polymer flow or feedflow	1 Channel 2 Channel	RTC-SD (1C) RTC-SD (2C)	LXZ516.99.A0101 LXZ516.99.A0111
Dissolved air flotation (RTC-DAF)	Control of TSS in flotated sludge and TSS in clear water. Output: Dosing of Coagulant and polymer, dosing of acid and or caustic	1 Channel	RTC-DAF (1C)	LXZ517.99.B0101
		2 Channel	RTC-DAF (2C)	LXZ517.99.B0111
OPC SERVER including configuration (Brand and type of PLC has to be defined)			OPC	LXZ515.99.B0000

Product description		Article #
Hardware	DIN Rail IPC with UI and Basic SW (CX5130 Beckhoff)	LXV515.99.0005B
	11,6" touch wide screen (CP2711, Beckhoff)	LXV515.99.0002B
	15,6" touch wide screen (CP2716, Beckhoff)	LXV515.99.0003B
	18,5" touch wide screen (CP2718, Beckhoff)	LXV515.99.0004B
Hardware	DIN Rail IPC with UI and Basic SW (SIEMENS IPC427E Microbox)	LXV515.99.0005C
	15" touch wide screen (SIEMENS IPC477E)	LXV515.99.0003C
	19" touch wide screen (SIEMENS IPC477E)	LXV515.99.0004C
Remote	4G SIM Card Router with Power Supply	LZH371
Others	RTC upgrade from std. single to std. combined	LXZ515.99.00001
	Std. combined extension	LXZ515.99.00002
	RTC basic software configuration on existing hardware (Visualization and data base)	LXZ515.99.00003
	RTC Software adoption / modification / extension (after consultation with RTC BU)	LXZ515.99.00005
Service		Article #
Service	StartUp for RTC, 1 channel	S-XCOMM-RTC-1
	StartUp for RTC, 2 channels	S-XCOMM-RTC-2
	StartUp for RTC, 3 channels	S-XCOMM-RTC-3
	StartUp for RTC, 4 channels	S-XCOMM-RTC-4
	StartUp for RTC, 5 channels	S-XCOMM-RTC-5
	StartUp for RTC, 6 channels	S-XCOMM-RTC-6
	StartUp for RTC, 7 channels	S-XCOMM-RTC-7
	StartUp for RTC, 8 channels	S-XCOMM-RTC-8
	StartUp for RTC, 9 channels	S-XCOMM-RTC-9
	StartUp for RTC, 10 channels	S-XCOMM-RTC-10
	StartUp for RTC, 11 channels	S-XCOMM-RTC-11
	StartUp for RTC, 12 channels	S-XCOMM-RTC-12
	StartUp for RTC, 13 channels	S-XCOMM-RTC-13
	StartUp for RTC, 14 channels	S-XCOMM-RTC-14
	StartUp for RTC, 15 channels	S-XCOMM-RTC-15
	StartUp for RTC, 16 channels	S-XCOMM-RTC-16

PO4-P precipitation

P-RTC application area

- Plants with chemical P-removal (measurement point before or after the point of chemical application or any combination of those).
- Plants with varying phosphorus loads in their inflow
- Plants using Al, Fe, and combination products as precipitant

P-RTC description

Control module for load-dependent precipitant dosage for chemical phosphate elimination.

The P-RTC (Phosphate Removal Real Time Controller) controls the PO4-P (soluble phosphorus) concentration based on the continuously measured PO4-P concentration and the waste water flow rate. The open loop P-RTC considers the biological phosphorous uptake and true chemical efficiency to ensure the minimum amount of precipitant is added to meet the PO4-P setpoint. Closed loop control uses specialized PID loops to ensure very low set points can be used without problematic over reaction common in conventional PID loops. Combination of these advanced controls ensures a direct "fit" to almost any plant configuration and allows new strategies not previously available. Namely, dynamic PO4-P set points to automatically react to solids loss events, or automated "policing" dosing to ensure separate dosing systems work in harmony to secure total P and where applicable metal ion compliance.

Robust fall back strategies are integral to Hach RTC. If input signals for inflow or ortho phosphate concentration are not available, the system automatically switches to a user defined fall back strategy choice.

P-RTC benefit

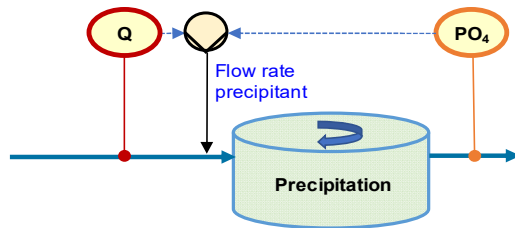
- supports compliance on P_TOT as precipitant is added according to the actual PO4-P load to be precipitated
- avoids overdosing of precipitant resulting in
 - no over spending for precipitant
 - no increased production of precipitation sludge which has to be treated and disposed
 - no loss of acid capacity, potentially harming nitrification

Versions

LXZ515.99.A1010 (single Channel) LXZ515.99.A1011 (double Channel)
 VERSION: RTC-P_CL (1C) RTC-P_CL (2C)
 Closed loop control PO4, Output: precipitant flowrate

I/O and param. / channel

- RTC-P output**
- Precipitant flow rate
 - Controller status signal
- RTC-P input**
- PO4-P concentration
 - Flow rate inflow wwtp
 - Flow rate return activated sludge and internal recirculation (if available)
- RTC-P control parameter**
- Set point for PO4-P
 - Min/max precipitant flow rate



In this version the ortho phosphate concentration is measured after the precipitant is added. A specialized PID algorithm considering flow rates is applied to provide stable control even at ortho phosphorus set-points < 0,5mg/l. The closed loop control approach ensures that the ortho phosphate concentration of the effluent is constantly kept to the desired set point and provides a measurement value to prove effective control.

Precipitant has to be well mixed with the waste water stream before the measurement sample is taken. The application of this technique is not specifically limited by hydraulic retention time. As the precipitation chemicals are highly acidic they "equalize" rapidly across a settlement or aeration phase (just as pH adjustment rapidly effects the whole tank volume).

Typical configuration:

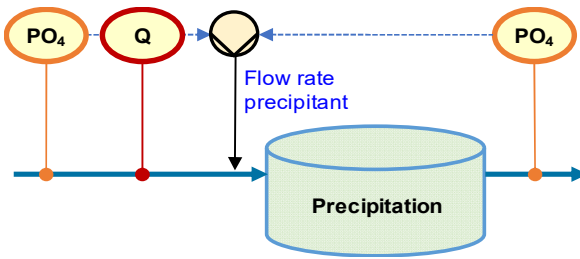
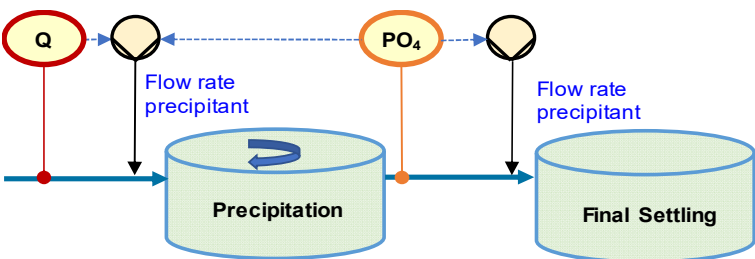
Dosing effluent aeration / PO4-P measurement distribution chamber to the final sediment

Versions		I/O and param. / channel
<p>LXZ515.99.A1110 (single Channel) LXZ515.99.A1111 (double Channel)</p> <p>VERSION: RTC-P_OL (1C) RTC-P_OL (2C)</p> <p>Open loop control PO4, Output: precipitant flowrate</p>		<p>RTC-P output</p> <ul style="list-style-type: none"> - Precipitant flow rate - Controller status signal <p>RTC-P input</p> <ul style="list-style-type: none"> - PO4-P concentration - Flow rate inflow wwtp - Flow rate return activated sludge (if available) - Flow rate internal recirculation (if available) <p>RTC-P control parameter</p> <ul style="list-style-type: none"> - Set point PO4-P open loop control - Min/max precipitant flow
<p>LXZ515.99.A1210 (single Channel)</p> <p>VERSION: RTC-P_CLCL</p> <p>Closed loop control PO4 considering P_tot / TSS in effluent, Output: precipitant flowrate</p>		<p>RTC-P output</p> <ul style="list-style-type: none"> - Precipitant flow rate - Controller status signal <p>RTC-P input</p> <ul style="list-style-type: none"> - PO4-P concentration after dosing point - Ptot in plant effluent - Flow rate inflow wwtp - Flow rate return activated sludge (if available) - Flow rate internal recirculation (if available) <p>RTC-P control parameter</p> <ul style="list-style-type: none"> - Set point PO4-P closed loop control - Set point P_TOT closed loop - Min/max precipitant flow

In this version the ortho phosphate concentration is measured before the precipitant is added. Allowances are then made for chemical efficiency and bio-P uptake. Knowing the concentration of ortho phosphorus in the feed and relating that to the user defined set point ensures chemical efficiency is correctly accounted for. This understanding sets HACH feed forward control apart from simple static stoichiometric approaches common in the industry and is particularly important when low ortho phosphorus set points are required.

Typical configuration
- Dosing point: Flow channel toward FST/ PO4-P measurement: Effluent aeration

This RTC-P variant automatically reacts to elevated phosphorus associated with suspended solids in the final effluent. Using either a total phosphorus or suspended solids measurement in the final effluent, a user defined trigger level forces a lower ortho phosphorus set point in the primary control system to compensate for phosphorus unaffected by chemical dosing (particulate P). The combination of interlinking control loops is of particular importance when considering low phosphorus limits, short term events such as pin point floc or solids loss spikes due to flow conditions represent significant P compliance risk with lower phosphorus limits.

Versions		I/O and param. / channel
<p>LXZ515.99.A1310 (single Channel) LXZ515.99.A1411 (double Channel)</p> <p>VERSION: RTC-P_OLCL (1C) RTC-P_OLCL (2C)</p> <p>Combination open / closed loop control PO₄, Output: precipitant flowrate</p>  <p>This RTC-P variant combines primary open loop control with closed loop "fine trim", informing the precipitant flow rate for one dosing point. This philosophy is particularly useful for sites with oversized assets where immediate reaction to load peaks is especially important.</p>	<p>RTC-P output</p> <ul style="list-style-type: none"> - Precipitant flow rate for one dosing point - Controller status signal <p>RTC-P input</p> <ul style="list-style-type: none"> - PO₄-P concentration before dosing - PO₄-P in after dosing - Flow rate inflow wwtp - Flow rate return activated sludge (if available) - Flow rate internal recirculation (if available) <p>RTC-P control parameter</p> <ul style="list-style-type: none"> - Set point PO₄-P closed loop - Min/max precipitant flow 	
<p>LXZ515.99.A1311</p> <p>VERSION: RTC-P_CLOL</p> <p>Combination open / closed loop control PO₄, Output: precipitant flowrate</p>  <p>This RTC-P variant enables two dose points to be optimized from one ortho phosphate measurement. Firstly, closed loop algorithms using a specialized PID control loop allow stable ortho phosphate levels to be passed forward to the secondary dose point. This allows residual phosphorus to be always made available to the biological stage. This residual can then be safely reduced to very low levels using an open loop philosophy on the secondary dose point. Alternatively, if the load conditions overwhelm the primary dosing point, the secondary open loop control can compensate to ensure breakthrough of orthophosphate does not occur. The ability to choose the balance of phosphorus removal across to dosing points opens up further chemical efficiency.</p> <p>This approach is particularly suited to WwTW's with low total phosphorus consents, challenging chemistry or extreme ortho phosphate load conditions.</p> <p>Typical configuration: Precipitant dosing 1: Aeration / PO₄-P measurement effluent aeration Precipitant dosing 2: Inflow final sedimentation (after PO₄-P measurement)</p>	<p>RTC-P output</p> <ul style="list-style-type: none"> - Precipitant flow rate for 2 dosing points - Controller status signal <p>RTC-P input</p> <ul style="list-style-type: none"> - PO₄-P concentration near/after dosing point - Flow rate inflow wwtp - Flow rate return activated sludge (if available) - Flow rate internal recirculation (if available) <p>RTC-P control parameter</p> <ul style="list-style-type: none"> - Set point PO₄-P closed loop control - Set point PO₄-P open loop control - Min/max precipitant flow 	

Versions		I/O and param. / channel
LXZ520.99.C2101 (single Channel)	LXZ520.99.C2111 (double channel)	RTC N/DN Output - Activation signal for aeration - DO set-point per channel - Blower stage [1...6] - Blower frequency [0 ...100%] - Controller status signal RTC N/DN Input - NH4-N and NO3-N - SBR Version: Activation signal (filling) - DO concentration for each lane - Option: Flow rate wwtp Main control parameter - Target value NH4-N & NO3-N - Weighting NH4-N & NO3-N - Maximum NH4-N (stop deni) - Min/max DO concentration - Parameter for DO PID control (closed-loop)
LXZ520.99.D2101 (single Channel SBR)	LXZ520.99.D2111 (double Channel SBR)	
VERSION: RTC-N/DN_DO 2VSD (1C)	RTC-N/DN_DO 2VSD (2C)	
RTC-N/DN SBR_DO 2VSD (1C)	RTC-N/DN SBR_DO 2VSD (2C)	
Intermittent aeration & O2 control, Output: Aeration on/off, 6 aeration stages, 2 VSD		

Simultaneous denitrification (RTC-SND)

RTC-SND application area

Typically carousel mixed (not plug flow) Activated sludge systems with aerated and non aerated zones within treatment basin. All plants with simultaneous nitrification/denitrification controlling aerated volume.

RTC-SND description:

Carousel flow ASP's often suffer from the problem of where to place the DO probe. The RTC-SND control system removes the problem entirely. Direct measurement for NH₄-N and NO₃-N in the treatment basin allows the control to safely step away from DO set points, instead relying on aeration intensity as a means of controlling aeration and anoxic volume within the tank. Measurement of NO₃-N allows safe minimum aeration to drive NO₃-N consumption as an oxygen source without the risk of resolubilization of ortho phosphate. Measurement of ammonium allows a clear understanding of aeration intensity requirement and ensures the discharge levels meets the user defined set points. More than this the user can decide which parameter takes priority for treatment, so if the site has a particularly challenging ammonium permit limit for example, higher priority can be given to this.

Optionally 6 digital and 2 analog signals are provided to provide specific control to the aerators / aeration zones in the aeration tank, based on the calculated RTC-SND calculated output.

Additionally to this the control can be linked with RTC-SRT. Sludge age can be particularly difficult to control well on these plants as it depends on aerated volume which can be highly variable (compared to plug flow ASP's). RTC-SRT for this type of plant automatically estimates aerated volume to provide a high quality sludge wastage rate using measured DO within the tank.

Further value can be obtained from this measurement to ensure a minimum DO threshold is maintained. If this falls below or exceeds adjustable limits, the aeration intensity signal is increased/decreased and aerators are activated/deactivated ensuring the DO concentration is between the limits.

If input signals for NH₄-N, NO₃-N or DO are not available the system automatically switches to fallback strategies.

RTC-SND benefit

- Improves settlement characteristics of MLSS due to reliable maintenance of anoxic zones providing unfavorable conditions for filamentous bacteria.
- Opens the opportunity to achieve much lower total nitrogen levels than conventional control can deliver.
- Significant savings on aeration energy due applying only the air that is required and unlocking the nitrate value present from effective denitrification (typical 10 %... 20% compared to fixed DO aeration methods)
- Improved acid capacity/alkalinity recovery due to enhanced denitrification
- Minimized denitrification/off gassing in final clarification tank
- Constant validated proof control maintaining user specified set points

Versions		I/O and param. / channel
<p>LXZ522.99.A0101 (single Channel) LXZ522.99.A0111 (double Channel) VERSION: RTC-SND (1C) RTC-SND (2C) NH₄ & NO₃ control, Output: Aerated volume (0...100%)</p> <div style="text-align: center; padding: 10px;"> </div>	<p>RTC-SND output</p> <ul style="list-style-type: none"> - Aeration intensity [0...100%] - Controller status signal <p>RTC-SND input</p> <ul style="list-style-type: none"> - NH₄-N and NO₃-N concentration - DO concentration - Option: Flow rate wwtp <p>RTC-SND control parameter</p> <ul style="list-style-type: none"> - Target value NH₄-N & NO₃-N - Weighting factor NH₄-N & NO₃-N - Min/max DO concentration 	
<p>LXZ522.99.B0101 (single Channel) LXZ522.99.B0111 (double Channel) VERSION: RTC-SND (1C6Z) RTC-SND (2C6Z) NH₄ & NO₃ control, Output: Aerated volume (0...100%), Output: 6 stages, 2 VSD</p> <div style="text-align: center; padding: 10px;"> </div>	<p>RTC-SND output</p> <ul style="list-style-type: none"> - Aeration intensity [0...100%] - Blower / valve stage [1...6] - Blower frequency [0 ...100%] - Controller status signal <p>RTC-SND input</p> <ul style="list-style-type: none"> - NH₄-N and NO₃-N concentration - DO concentration - Option: Flow rate wwtp <p>RTC-SND control parameter</p> <ul style="list-style-type: none"> - Target value NH₄-N & NO₃-N - Weighting factor NH₄-N & NO₃-N - Min/max DO concentration 	

Nitrification, plug flow

RTC-N application area

- Plants with plug flow nitrification basins
- Step feed plants (cascade denitrification)

RTC-N description:

The RTC-N control software calculates the required DO concentration in the aeration basins to achieve a user defined NH₄-N set point concentration in the aeration effluent. To do this (amongst other factors), it accounts for temperature, hydraulic retention time, amount of nitrifying bacteria in the MLSS and actual discharged ammonium concentration in the aeration effluent. More than this it provides ideal dissolved oxygen levels for each of the ASP aerated zones as the ammonium load travels along the lanes. Concentrating the air to the zones of greatest need both saves energy and maximizes the value of the available process air. This has the potential to unlock performance not typically observed on ASP's and provide enhanced compliance security. By combining an accurate open loop dissolved oxygen set point with closed loop fine trim, a much more dynamic DO set point can safely be used to save energy and provide greater treatment capacity every day.

The RTC-N can be used in conjunction with IRC, SZ, SRT

Optionally an additional DO controller compliments the RTC-N. This DO controller activates

- in the single DO version a single aeration device equipped with a VSD
- in the 6 stage VSD version up to six aeration devices, two of those optionally equipped with a variable frequency drive (VFD) providing smooth adjustment of aeration intensity, high blower efficiency and protection against excessive switching of duty.

If input signals for NH₄-N, NO₃-N or TSS are not available the system automatically switches to fallback strategies.

RTC-N benefits:

- Ensure compliance on NH₄-N due to load based O₂ set point adjustment
- Improved denitrification and compliance on N_{TOT} due to load based aeration (less O₂ recirculated)
- Energy savings: 10 %... 20% due to lower DO concentration in aeration (compared to fixed O₂ control on 1,5mg/l ... 2,5mg/l)
- DO recovery due to improved denitrification.
- Focused air supply to areas of highest requirement (RTC-N4Z)
- Improved denitrification capacity due to adjusted volume for nitrification (RTC-N4Z)
- Improved sludge settlement qualities through DO levels matching organic load and well maintained anoxic zones

Versions		I/O and param. / channel
<p>LXZ519.99.B0101 (single Channel) LXZ519.99.B0111 (double Channel)</p> <p>VERSION: RTC-N-RTC (1C) RTC-N-RTC (2C)</p> <p>Combination open / closed loop NH₄ control, Output: O₂ setpoint</p>	<p>RTC-N output</p> <ul style="list-style-type: none"> - DO set-point - Controller status signal <p>RTC-N input</p> <ul style="list-style-type: none"> - NH₄-N inlet and effluent - TSS concentration aeration - DO concentration - Flow rates: inflow, internal recirculation; surplus activated sludge <p>RTC-N control parameter</p> <ul style="list-style-type: none"> - Parameter for NH₄-N PID control - Min/max DO, max. rate of change 	
<p>LXZ519.99.B3101 (single Channel) LXZ519.99.B3111 (double Channel)</p> <p>VERSION: RTC-N_DO (1C) RTC-N_DO (2C)</p> <p>Combination open / closed loop NH₄ control, Output: Aeration on/off, 1 aeration stage, VSD</p>	<p>RTC-N output</p> <ul style="list-style-type: none"> - DO set-point - Blower frequency [0 ...100%] - Controller status signal <p>RTC-N input</p> <ul style="list-style-type: none"> - NH₄-N inlet and affluent - TSS concentration aeration - DO concentration - Flow rates: inflow, internal recirculation, surplus activated sludge <p>RTC-N control parameter</p> <ul style="list-style-type: none"> - NH₄-N set point effluent aeration - Parameter for NH₄-N PID control - Min/max DO, max. rate of change 	

Versions		I/O and param. / channel
<p>LXZ519.99.B2101 (single Channel) LXZ519.99.B2111 (double Channel) VERSION: RTC-N_DO 2VFD (1C) RTC-N_DO 2VFD (2C) Combination open / closed loop NH₄ control, with O₂ control, Output: O₂ setpoint, 6 aeration stages, 2 VSD)</p>		<p>RTC-N output</p> <ul style="list-style-type: none"> - DO set-point - Blower stage [1...6] - Blower frequency [0 ...100%] - Controller status signal <p>RTC-N input</p> <ul style="list-style-type: none"> - NH₄-N inlet and effluent - TSS concentration aeration - DO concentration in each zone - Flow rates: inflow, internal recirculation; surplus activated sludge <p>RTC-N control parameter</p> <ul style="list-style-type: none"> - NH₄-N set point effluent aeration - Parameter for NH₄-N PID control - Min/max DO, max. rate of change
<p>LXZ519.99.D0101 (single Channel) LXZ519.99.D0111 (double Channel) VERSION: RTC-N_4Z (1C) RTC-N_4Z (2C) Combination open / closed loop NH₄ control, Output: O₂ setpoints for 4 zones, control of one swing zone</p>		<p>RTC-N output</p> <ul style="list-style-type: none"> - DO set-point for up to 4 zones (one zone facultative aeration) - Controller status signal <p>RTC-N input</p> <ul style="list-style-type: none"> - NH₄-N inlet and effluent - TSS concentration aeration - DO concentration in each zone - Flow rates: inflow, internal recirculation, surplus activated sludge <p>RTC-N control parameter</p> <ul style="list-style-type: none"> - NH₄-N set point effluent aeration - Parameter for NH₄-N PID control - Min/max DO, max. rate of change for each zone
<p>LXZ519.99.D1101 (single Channel) LXZ519.99.D1111 (double Channel) VERSION: RTC-N_STEP (1C) RTC-N_STEP (2C) Combining open / closed loop NH₄ control on Step Feed reactors, Output: O₂ set points for 3 zones</p>		<p>RTC-N output</p> <ul style="list-style-type: none"> - DO set-point for up to 3 zones - Controller status signal <p>RTC-N input</p> <ul style="list-style-type: none"> - NH₄-N concentration inlet and effluent - TSS concentration aeration - DO concentration in each zone - Flow rates: inflow, internal recirculation; surplus activated sludge <p>RTC-N control parameter</p> <ul style="list-style-type: none"> - NH₄-N set point effluent aeration - Parameter for NH₄-N PID control - Min/max DO, max rate of change for each zone
<p>The RTC_N_4Z considers for up to 4 aerated zones the hydraulic retention time of the NH₄-N load in each aerated zone for set point calculation. This feature allows to provide the air exactly to the zones with the highest air demand.</p> <p>Based on the inflow load and the current nitrification capacity the RTC_N_4Z calculates if a swing zone has to be aerated and used for nitrification to meet the NH₄-N effluent target or if it can be operated as an anoxic zone for enhanced denitrification in order to minimize the N_TOT effluent concentration and cost for aeration.</p>		
<p>The RTC_N_STEP is designed for step feed resp. cascade denitrification plants. Based on the influent NH₄-N concentration and the settled sewage inflow rate to each denitrification zone, for each nitrification zone the RTC_N_STEP calculates the DO concentration required to reach the NH₄-N target concentration is calculated.</p>		

DO control (RTC-DO)

RTC-DO application area

Biological Waster Water treatment plants. Independent DO control in multiple zones of an aeration tank. Each aerated zone is equipped with an actor (e.g. dedicated blower, surface aerator, air control valve with fixed pressure in manifold) and a dedicated DO sensor to control the DO concentration to a desired DO set point.

The RTC-DO can be combined with a RTC-N_4Z zone controller which provides up to 4 DO setpoints based on the current NH4-N loading of a lane.

RTC-DO description

The RTC DO independently controls in up to 16 zones the DO concentration to a desired DO set point. Adjusted variable is the aeration intensity to the corresponding zone. If diffused aeration is applied, air flow measurements and valve positions can be monitored if available.

RTC-DO benefits

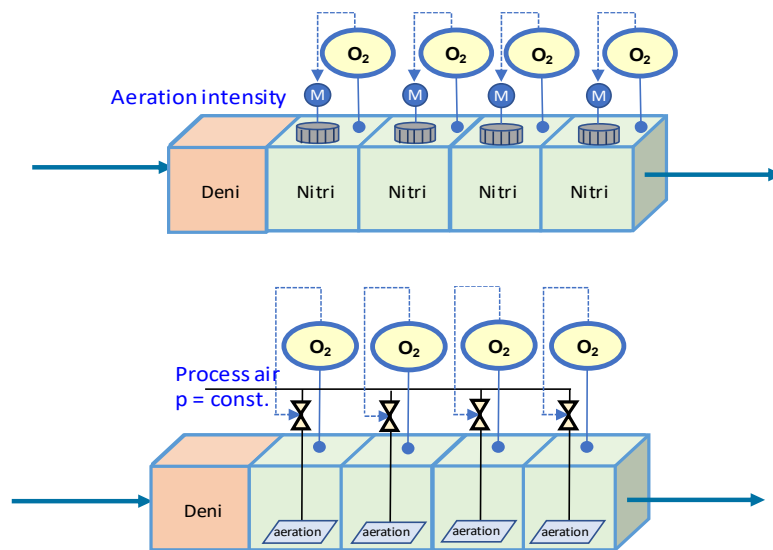
- minimizes aeration energy / drives cost savings
- Increase process treatment capacity in an ASP

Versions

LXZ530.99.C0101 4 actors	LXZ530.99.D0101 8 actors
LXZ530.99.C0111 12 actors	LXZ530.99.D0111 16 actors

I/O and param. / channel

- DO-RTC output**
- up to 16 valve setpoints for zone valve opening degrees
 - Controller status signal
- DO-RTC input**
- up to 16 zone DO conc.
 - Optionally: DO setpoints from RTC-N
- DO-RTC control parameter**
- PID-control parameter



Most open valve DO control (RTC-MOV)

RTC-MOV application area

All waste water treatment plants with multiple aeration zones. Process air is provided from a manifold. Each aerated zone is equipped with an automatic air valve and a DO sensor to control the DO concentration to a desired DO set point.

The MOV controller can be combined with a N-RTC 4 zone controller which provides up to 4 DO setpoints based on the current NH4-N loading of a lane.

RTC-MOV description

The RTC-MOV (Most open valve) independently controls in up to 16 zones the DO concentration to a desired DO set point. Adjusted variable is the opening degree of the air valve assigned to the corresponding zone. If the air is provided through a common manifold, the RTC-MOV can provide a set point for the manifold air pressure ensuring that the valve assigned to the volume with highest air demand has got the highest opening degree (Most open valve control). Optionally a set point for the overall air flow can be provided. The pressure on the manifold has to be controlled by the PLC.

In order to react fast to changes in the manifold pressure (caused by load changes or changes in the opening degree of the other air valves) the MOV-RTC can be designed as a cascade controller

RTC-MOV benefits

- Efficiently drives process air to zones of greatest need, maximising treatment potential of ASP
- minimize aeration energy / drive cost savings
- Increase process treatment capacity in an ASP

Versions

LXZ530.99.A0101 4 valves	LXZ530.99.B0101 8 valves
LXZ530.99.A0111 12 valves	LXZ530.99.B0111 16 valves

I/O and param. / channel

MOV-RTC output

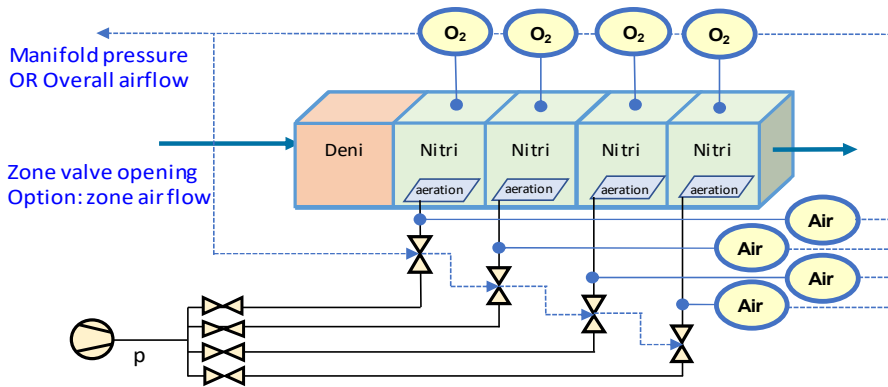
- up to 16 valve setpoints for zone valve opening degrees
- Option: Up to 16 set points for zone air flow
- setpoint for manifold pressure
- Option: Overall airflow set point
- Controller status signal

MOV-RTC input

- up to 16 zone DO concentration
- up to 16 zone air flow signals
- Optionally: DO setpoints from N-RTC

MOV-RTC control parameter

- PID-control parameter



Denitrification (RTC-DN)

RTC-DN application area

- Pre-denitrification plants with internal recirculation
- Plants dosing external carbon to ensure compliance on N_TOT

RTC-DN description

The controller optimises both internal recirculation and/or carbon dose flow rates to maximise the available NO₃-N removal of an ASP. Both approaches are based on measured NO₃-N concentration typically at the discharge of the denitrification stage. Further treatment enhancements are provided by protection against oxygen carryover from the internal recirculation.

For plug flow ASP's a particularly helpful addition is the swing zone controller (in conjunction with N-RTC). This safely allows the ASP to extend the anoxic zone by "sacrificing" aeration volume (zone 1 of a lane) when load conditions allow. Especially useful in low flow / load conditions (every night) where minimum air flow requirements often cause oxygen carry over to inhibit denitrification.

If input signals for NO₃-N, DO or flow rate are not available, the system automatically switches to considered fallback strategies.

RTC-DN benefits

- Maximized leverage of denitrification capacity and improved compliance on N_TOT due to minimized O₂ transfer from nitrification to denitrification
- Reduced O₂ demand (less aeration energy) due to O₂ recovery from denitrification
- Reduced risk breaching COD effluent limit due to overdosing of external carbon
- Minimized cost for product and aeration (if overdosed)
- Improved acid capacity (alkalinity) recovery

Versions	I/O and param. / channel
<p>LXZ521.99.A0101 (single Channel) LXZ521.99.A0111 (double Channel) VERSION: RTC-DN_IRC (1C) RTC-DN_IRC(2C) Closed loop control NO₃ effluent anoxic or aeration. Output: Internal recirculation</p> <div style="text-align: center; margin: 10px 0;"> </div>	<p>RTC-DN_IRC output</p> <ul style="list-style-type: none"> - Internal recirculation flow [L/s] - Controller status signal <p>RTC-DN_IRC input</p> <ul style="list-style-type: none"> - NO₃-N concentration effluent denitrification or effluent aeration - Option: DO concentration effluent aeration - Flow rate <p>RTC-DN_IRC control parameter</p> <ul style="list-style-type: none"> - Target value for NO₃-N effluent denitrification zone - Option: Target value for NO₃-N effluent nitrification zone - Min/max IRC flow rate
<p>LXZ521.99.D0101 (single Channel) LXZ521.99.D0111 (double Channel) VERSION: RTC-DN_C (1C) RTC-DN_C (2C) Combination open / closed loop NO₃-N control. Output: External carbon flow</p> <div style="text-align: center; margin: 10px 0;"> </div>	<p>RTC-DN_C output</p> <ul style="list-style-type: none"> - Set point ext. C dosing rate [L/h] - Controller status signal <p>RTC-DN_C input</p> <ul style="list-style-type: none"> - NO₃-N concentration effluent denitrification - Option: NO₃-N inflow denitrification - Flow rate (pot. incl. IRC) <p>RTC-DN_C control parameter</p> <ul style="list-style-type: none"> - Set point NO₃-N effluent denitrification - PID control parameter - Min/max external Carbon flow rate

Versions		I/O and param. / channel
LXZ521.99.B0101 (single Channel)	LXZ521.99.B0111 (double Channel)	RTC-DN_IRC_C output - Set point internal recirculation flow rate [L/s] - Set point external C dosing rate [L/h] - Controller status signal RTC-DN_IRC_C input - NO3-N concentration effluent denitrification - NO3-N concentration effluent aeration - Option: DO concentration NO3-N concentration effluent aeration RTC-DN_IRC_C control parameter - Target value NO3-N effluent denitrification - Min/max IRC flow rate - Min/max external C flow rate - PID control parameter
VERSION: RTC-DN_IRC_C (1C)	RTC-DN_IRC_C (2C)	
Closed loop control NO3 effluent denitrification or effluent aeration. Output: Internal recirculation and external carbon		

Nutrient dosing

RTC-C/N/P application area

- All biological treated waste with an imbalance of Nitrogen and/or Phosphorus with respect to COD/BOD.
- The RTC-C/N/P can be combined with the SRT-RTC to avoid the growth of nitrifiers further enhancing COD removal

RTC-C/N/P description

The RTC C/N/P maintains ideal nutrient levels within wastewater to ensure COD/BOD treatment is not biologically limited. This is achieved using feed forward control with online TOC measurement allied to feedback control using ammonium and ortho phosphate measurement. Further flexibility allows user defined nutrient ratios to be input for specific process waste streams. Additionally, there is an option to supplement the feed forward algorithm with N and /or P measurements to automatically account for variations in background nutrient levels and TOC values.

In order to avoid unwanted nitrification, nitrate concentration in the effluent can be measured to inform aeration conditions.

If input signals for TOC, NH₄-N, PO₄-P, NO₃-N or flow rate are not available, the system automatically switches to considered fallback strategies.

RTC-C/N/P benefits

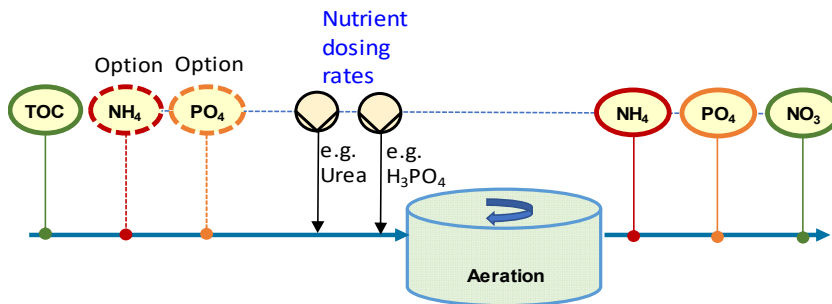
- Ensure compliance on COD/BOD, NH₄ / total N and PO₄
- Improved sludge sedimentation characteristics
- Avoid nitrification (in conjunction with RTC-SRT)
- Minimized cost on nutrients added.
- Ineffective aeration avoided

Versions

LXZ514.99.B0101 (single Channel) LXZ514.99.B0111 (double Channel)

VERSION: RTC-C/N/P (1C) RTC-C/N/P (2C)

Organic load based nutrient dosing combined with effluent nutrient control. Output: External Nitrogen and Phosphorous dosing rate



I/O and param. / channel

RTC-C/N/P output

- Set point dosing rate urea [L/h]
- Set point dosing rate phosphoric acid [L/h]
- Specific nutrient dosing rates (N/TOC and P/TOC)
- Controller status signal

RTC-C/N/P input

- TOC concentration
- Option: Inflow: NH₄-N and PO₄-P
- Effluent: NH₄-N, NO₃-N-, PO₄-P
- Inflow
- Flow rate Urea
- Flow rate Phosphoric acid

RTC-C/N/P control parameter:

- Specific urea dosing rates N/TOC
- Specific phosphoric acid dosing rates P/TOC
- Set point PO₄-P, NH₄-N and NO₃-N effluent aeration
- Min / Max dosing rate
- Min / Max specific dosing rate
- PID Control parameter

Sludge retention time (RTC SRT)

RTC-SRT application area

- All biological stages requiring wastage of biology (Activated sludge systems)

RTC-SRT Description

The SRT controller automatically maintains the correct amount and type of biology in the treatment basin. Biological growth and decay rates are determined using measured sewage temperature (typically from DO probe). The aerated treatment volume is taken into account (particularly important with intermittent or carousel ASP's), then the mass of biology to be wasted can accurately be determined. Measurement of solids within the wasteactivated sludge (typically RAS) allows conversion to a waste volume that can then be acted on. An additional solids measurement in the final effluent can be incorporated into the control to account for additional solids lost from the treatment system.

This control can be used to provide ideal conditions for ammonium removal (avoiding high MLSS in summer placing unnecessary pressure on aeration systems, and too low MLSS in winter risking ammonium compliance). Alternatively a sludge age can be manually entered (e.g 3.5 days) to inhibit nitrification and direct process air more specifically for COD/BOD treatment - especially useful for sites without ammonium limits.

Additionally to this the user can specify minimum and maximum MLSS levels in the aeration basin. So if a plant temporarily suffers poor settlement problems, the mass flux of the final tanks can be calculated and the controller will not allow the MLSS to raise above that point, protecting against sludge blanket loss.

Additional safety factors are built in to protect the sludge volume wasted does not exceed the sludge processing capacity of a facility.

If input signals for TSS or DO are not available, the system automatically switches to considered fallback strategies.

RTC-SRT benefits

- Ensures compliance on ammonium or COD/BOD
- Prevents excessive air demand on blower system in warmer weather
- Saves on aeration energy (circa 5-10%)
- Improves sludge age calculation accuracy by considering large data sets (reduces human error in this area)

Versions	I/O and param. / channel
<p>LXZ518.99.A0101 (single Channel) LXZ518.99.A0111 (double Channel)</p> <p>VERSION: RTC-SRT (1C) RTC-SRT (2C)</p>	<p>RTC-SRT output</p> <ul style="list-style-type: none"> - Flow rate excess sludge [L/s] - Controller status signal <p>RTC-SRT input</p> <ul style="list-style-type: none"> - TSS concentration activated sludge [g/L] - TSS concentration surplus activated sludge [g/L] - DO concentration in up to 4 zones [mg/L] - Temperature [°C] - Excess sludge flow rate [L/s] <p>RTC-SRT control parameter</p> <ul style="list-style-type: none"> - Table for SRT target value - Safety factor for SRT calculation - Min/Max flow rate for SAS - Min/max TSS concentration in activated sludge tank
<p>The diagram illustrates a wastewater treatment process. It starts with an 'Aeration' tank where wastewater is treated. Above this tank are four sensors: O₂, Temp, TSS, and another TSS sensor. The treated water then flows into a 'Final Settling' tank. Above this tank is a TSS sensor and a flow rate sensor labeled 'Q'. Below the final settling tank, there are two lines: 'RAS' (Return Activated Sludge) and 'SAS' (Surplus Activated Sludge). A pump is connected to the SAS line, and an arrow labeled 'Excess sludge draw off' points away from the pump. A dashed line connects the TSS sensor above the final settling tank to the flow rate sensor 'Q'.</p>	

Chlor-Dechlor (CL2-RTC)

RTC-CL2 application area

- Waste Water Treatment plants with Disinfection processes based on Chlorine

RTC-CL2 Description

The Chlorination Controller controls the Total Residual Chlorine (TRC) or Total Free Chlorine concentration measured after the disinfection contact chamber. The controller includes an open loop controller which calculates a Chlorine dosage required to meet an adjustable specific chlorine dosing rate [mg CL₂/l] considering the actual waste water flow rate at the dosing point. This flow proportional control can be combined with a closed loop control of the TRC or the TFC concentration measured after the contact chamber. Optionally the contact time Contact Time (CT) measured by the TRC effluent disinfection actual flow rate and the volume of the contact chamber can be controlled to a desired set point. Actuated variable is the change in the specific chlorine dosing rate. To compensate for pH and temperature changes the Setpoints for TRC, TFC or CT can automatically be adjusted to the measured pH and temperature in the inflow according to an input table with 4 supporting points.

An additional De-Chlorination Controller controls the level of TRC in the plant effluent. The De-chlorination controller is designed as an open loop controller. Based on TRC concentration measured after disinfection, the chemical properties of the reducing agent and the flow rate it calculates the amount of reducing agent required to meet the desired TRC concentration in the final plant effluent. If a quantitative TRC measurement is available, this open loop calculation can be combined with a closed loop control of the TRC concentration measured in plant effluent.

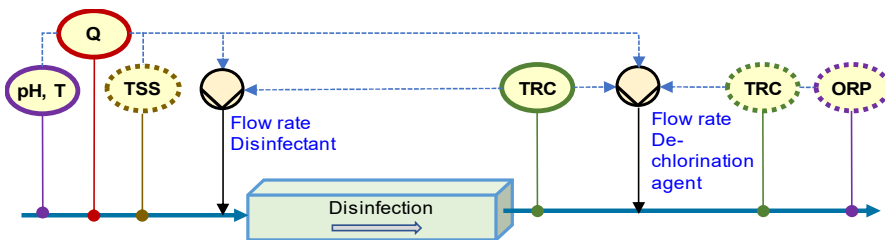
Optionally an ORP measurement can be added to identify a potential TRC breakthrough in plant effluent. An alarm is indicated if change in the ORP signal is above an adjustable limit.

Disinfection characteristics like Contact time, Chlorine demand, Decay and simultaneous demand and Log inactivation are also estimated and indicated.

RTC-CL2 benefits

- Ensures compliance solids TRC
- Savings on chemicals
- Transparency on disinfection process

Versions		I/O and param. / channel
LXZ531.99.A1010 (single Channel) VERSION: RTC-CL2 (1C)	LXZ531.99.A1011 (double Channel) RTC-CL2 (2C)	<p>RTC-CL2 output</p> <ul style="list-style-type: none"> - Flow rate Chlorine dosing - Flow rate de-chlorination agent - Controller status signal <p>RTC-CL2 input</p> <ul style="list-style-type: none"> - pH, T influent contact chamber - Total Residual Chlorine (TRC), alternative Total Free Chlorine (TFC) - Option: ORP <p>RTC-CL2 control parameter</p> <ul style="list-style-type: none"> - Specific dosing rate (mg CL₂/L) - PID Parameter - Min/Max Chlorine dosing rate



Sludge Thickening

RTC-ST application area

- Plants with mechanical sludge thickening devices (belt / drum thickeners etc.)
- Plant with varying TSS concentration in thickener feed flow
- Plants applying fixed polymer dosing rate / periodical adjustment based on visual judgement or lab results / flow proportional dosing
- Plants with low solids capture rate, unstable TSS concentration in filtrate and thickened sludge

RTC-ST description

The RTC-ST (sludge thickening) controller improves and stabilises thickened sludge concentration or filtrate quality in mechanical sludge thickening. Based on the solids load in the feed flow, either the polymer dosing rate or the feed flow rate is adjusted to a specific polymer dosing rate [g/kg]. This feed forward control can be combined with a feed back control of the TSS in the thickened sludge or in the filtrate to either increase or decrease the specific polymer dosing rate (within a user defined window).

Fixed polymer dosing rate variable feed sludge flow rate is particularly helpful strategy if an asset experiences solids feed overload.

RTC-ST benefits

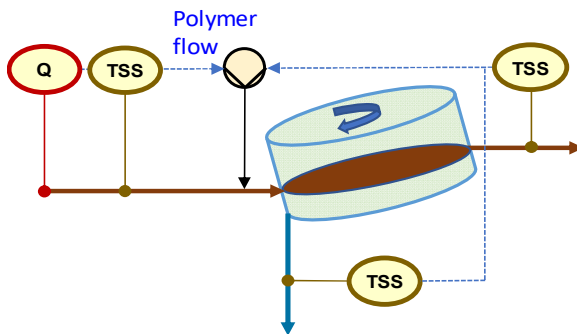
- Increased gas yield on anaerobic digestion due to high TSS in thickened sludge
- No polymer overdosing. Reduced maintenance work on sludge thickening machines (no belt blending).
- Reduced amount of polymer dosed
- Improved solids capture preventing recycling of solids to head of works

Versions

LXZ517.99.A0101 (single Channel) LXZ517.99.A0111 (double Channel)

VERSION: RTC-ST (1C) RTC-ST (2C)

Open and closed loop contr. of TSS in thickened sludge and/or filtrate. Output: Polymer flow and/or feed flow



I/O and param. / channel

RTC-ST output

- Polymer dosing flow rate or feed flow rate
- Controller status signal

RTC-ST input

- TSS concentration in feed flow
- TSS concentration in thickened sludge / filtrate
- Feed flow dewatering device
- Flow rate polymer dosing

RTC-ST control parameter

- Specific dosing rate (kg polymer / t TSS)
- PID Parameter for thickened sludge or filtrate TSS control

Sludge dewatering

RTC-SD application area

- Plants with sludge dewatering devices (centrifuges)
- Plants with changing TSS concentration in feed flow to the centrifuges
- Plants applying fixed polymer dosing rates based on visual judgement / lab results / flow paced

RTC-SD Description

The SD-RTC (sludge dewatering) controller adjusts polymer dosing rate or feed flow rate in mechanical sludge dewatering. Based on the current solids feed load (TSS concentration and flow rate), either the polymer dosing rate or the sludge feed flow rate is controlled ensuring an adjustable specific polymer dosing rate [gg/kg]. This feed forward control can be combined with a feed back control of the TSS in the centrate or dewatered sludge.

If input signals inflow or TSS concentration are not available the system automatically switches to fallback strategies.

RTC-SD benefits

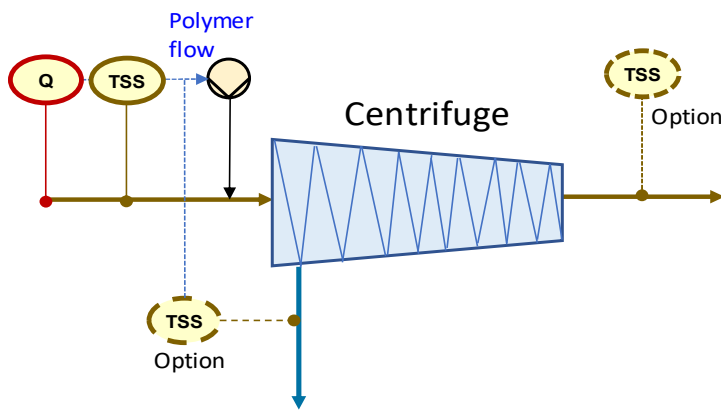
- Savings on polymer (typical 10 - 15% compared to fixed dosing rate)
- More consistent dewatered product
- Increased TSS concentration in dewatered sludge and subsequently decreased cost for sludge disposal
- Decreased TSS concentration in centrate and reduce issues on process water returns
- Reduce issues of foaming due to polymer overdose

Versions

LXZ517.99.B0101 (single Channel) LXZ517.99.B0111 (double Channel)

VERSION: RTC-SD (1C) RTC-SD (2C)

Control of TSS in dewatered sludge or centrate: Output: Polymer flow or feedflow



I/O and param. / channel

SD-RTC Output signals

- Polymer dosing flow rate or feed flow rate
- Controller status signal

SD-RTC Input signals

- TSS concentration in feed flow
- TSS concentration in dewatered sludge / centrate
- Feed flow dewatering device
- Flow rate polymer dosing

Main control parameter

- Specific dosing rate (kg polymer / t TSS)
- PID Parameter for dewatered sludge or centrate TSS control

Dissolved air flotation (RTC-DAF)

RTC-DAF application area

- Dissolved Air Flotation processes (DAF) in water treatment
- Plants with changing TSS (TOC) concentration in DAF feed
- Processes with unusable TSS in floated sludge
- Processes with poor solids capture (high solids in clear water)

RTC-DAF Description

This controller maximizes the solids removal and clear water quality through real time measurements. The DAF-RTC adjusts coagulant and flocculant dosing rates in Dissolved Air Flotation processes using a feed forward and 2 interlinking feedback control loops. Based on the current solids feed load (either TSS or TOC), the coagulant and flocculant dosing rates are added proportionally. To support coagulation the pH value in the inflow can be automatically buffered to a user defined point. In case the pH-value falls below or exceeds an adjustable pH limiting value, dosing of coagulant and flocculant are stopped.

The feedback trim then calculates the desired specific dosing rates for coagulant and flocculant are tuned based on the TSS concentration measured in the floated sludge and on the TSS (TOC) concentration measured in the clear water effluent respectively.

If input signals inflow or TSS (TOC) concentration are not available the system automatically switches to fallback strategies.

RTC-DAF benefits

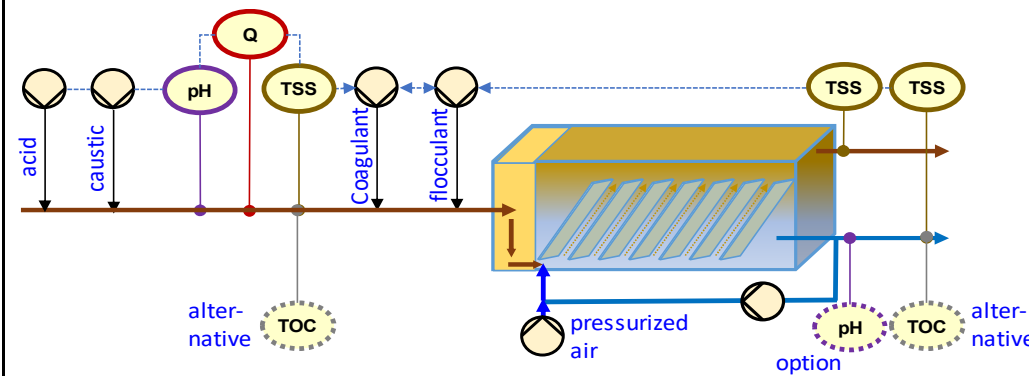
- achieve savings on coagulant, flocculant and caustic/acid flow rates
- increase TSS concentration in floated sludge and cost for further sludge treatment
- improve solids capture respectively decrease TSS concentration in clear water effluent

Versions

LXZ517.99.B0101 (single Channel) LXZ517.99.B0111 (double Channel)

VERSION: RTC-DAF (1C) RTC-DAF (2C)

Control of TSS in flotated sludge and TSS in clear water. Output: Dosing of Coagulant and polymer, dosing of acid and caustic



I/O and param. / channel

RTC DAF output





- Coag. / floccul. dosing rate
- caustic / acid flow rate
- feed flow rate
- Controller status signal

RTC DAF input

- TSS concentration in
 - feed flow
 - flotated sludge
 - clear waer effluent
- Feed flow rate
- Flow rate polymer / coagulant

RTC DAF control parameter

- Specific dosing rates
 - kg polymer / t TSS)
- PID Parameter for flotated sludge resp. clear water TSS (TOC) control
- PID parameter for pH control

General	Hardware	
<p>Hardware (Touch Panel): Industrial multi-touch built-in Panel PC designed for installation in the front door of a control cabinet. The IPC has got aluminum housing with glass front and one slot for one MicroSD Flash Card which is accessible from outside.</p> <p>RTC Integration The IPC is connected to the HACH LANGE measurement transmitter (sc1000) via RTC communication cards, which are installed in the sc1000 and enable data transmission between RTC and sc1000.</p>	<p>LXV515.99.0002B 11,6" touch wide screen (CP2711, Beckhoff) LXV515.99.0003B 15,6" touch wide screen (CP2716, Beckhoff) LXV515.99.0004B 18,5" touch wide screen (CP2718, Beckhoff) see https://www.beckhoff.com/ for detailed specification</p> <p>LXV515.99.0003C 15" touch wide screen (SIEMENS IPC477E) LXV515.99.0004C 19" touch wide screen (SIEMENS IPC477E) see https://www.siemens.com/ for detailed specification</p>	 
<p>Hardware (Din Rail): Industrial DIN Rail PC designed for installation in control cabinet. One Micro SD Flash Card which is accessible from outside.</p> <p>RTC Integration The IPC is connected to the HACH LANGE measurement transmitter (sc1000) via RTC communication cards, which are installed in the sc1000 and enable data transmission between RTC and sc1000.</p> <p>Access to the IPC can be given via VNC viewer or Team Viewer.</p>	<p>LXV515.99.0005B DIN Rail IPC with UI and Basic SW (CX5130 Beckhoff) see https://www.beckhoff.com/ for detailed specification</p> <p>LXV515.99.0005C DIN Rail IPC with UI and Basic SW (SIEMENS IPC427E Microbox) see https://www.siemens.com/ for detailed specification</p>	 

Integration via sc1000	Schematic
<p>The RTC modules are installed on an industrial PC. PLC is communicating to sc1000 via Profibus, Modbus TCP/IP or analogue (0/4...20mA). The internal communication card YAB117 is used for data exchange between IPC and sc1000.</p>	
<p>The RTC modules are installed on an industrial PC. Direct communication to flow sensors and actuators is done via external communication cards or internal cards integrated in the sc1000 transmitter.</p>	
Integration via OPC	Schematic
<p>RTC modules are installed on an industrial PC. PLC receives analytical data from sc1000 via Profibus, Modbus TCP/IP or analogue (0/4...20mA). IPC hosting the RTC modules is communicating to PLC via OPC server installed on IPC.</p>	

CLAROS connectivity	Schematic
<p>RTC modules are installed on an industrial PC. PLC receives analytical data from sc1000 via Profibus, Modbus TCP/IP or analogue (0/4...20mA).</p> <p>IPC hosting the RTC modules is communicating to PLC via OPC server installed on IPC.</p> <p>Remote access to RTC via CLAROS cloud (Data view and control parameter exchange).</p> <p>Currently limited to P-, N/DN, N, SRT, SD, ST-RTC.</p>	<p>The schematic illustrates the data flow for CLAROS connectivity. On the left, a PLC is connected to 'Actors: pumps, blower, ...'. The PLC sends 'measurements' to an 'IPC (RTC modules)' via an 'OPC' server. The IPC also sends 'flow / measurements to IPC' and 'Actuated variable to PLC' back to the PLC. The IPC is connected to a 'Sc1000 transmitter' via 'Modbus TCP/IP' or 'analogue (0/4...20mA)'. The transmitter is connected to 'Analytical sensors'. The IPC connects to the 'CLAROS cloud', which provides 'RTC access' to the 'CLAROS UI' (shown as a smartphone screen). The HACH logo is present in the bottom right corner.</p>
<p>RTC modules are installed on an industrial PC. PLC receives analytical data from sc4200 via Profibus, Modbus TCP/IP or analogue (0/4...20mA). ProfiNet and Ethernet/IP options available via Kunbus Gateway.</p> <p>IPC hosting the RTC modules is communicating to PLC via OPC server installed on IPC.</p> <p>Remote access to RTC and MSM access via CLAROS cloud.</p> <p>Currently limited to P-, N/DN, N, SRT, SD, ST-RTC.</p>	<p>The schematic illustrates the data flow for CLAROS & MSM connectivity. On the left, a PLC is connected to 'Actors: pumps, blower, ...'. The PLC sends 'measurements' to an 'IPC (RTC modules)' via an 'OPC' server. The IPC also sends 'flow / measurements to IPC' and 'Actuated variable to PLC' back to the PLC. The IPC is connected to a 'sc4200 transmitter' via 'Modbus TCP/IP' or 'analogue (0/4...20mA)'. The transmitter is connected to 'Analytical sensors'. The IPC connects to the 'CLAROS cloud', which provides 'RTC and MSM access' to the 'CLAROS UI' (shown as a smartphone screen). The HACH logo is present in the bottom right corner.</p>

