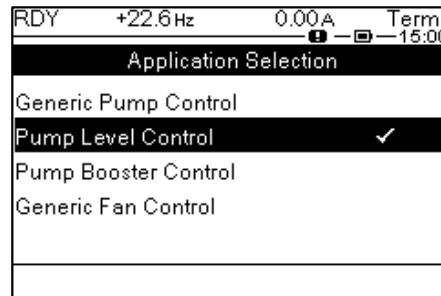


# Level Control

Level control commissioning (System tab)

- Level control function accessibility, first select macro configuration level control

(Complete settings → Macro Configuration)



- Pump configuration

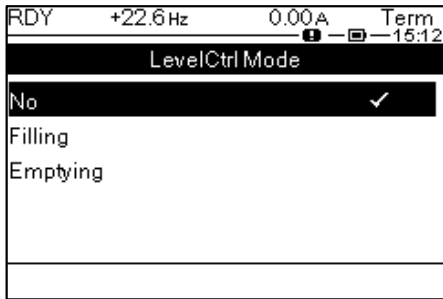
- Pump configuration (system tab) is common to booster function
  - Define your modes (single drive, multi-drive or multi-master)
  - Do the commissioning according to customer request (fault management, strategy, delays, ...)

# Level Control

Level control commissioning (Control tab)

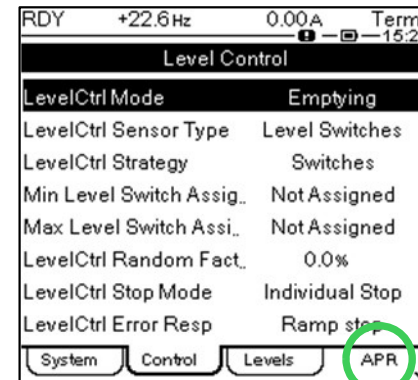
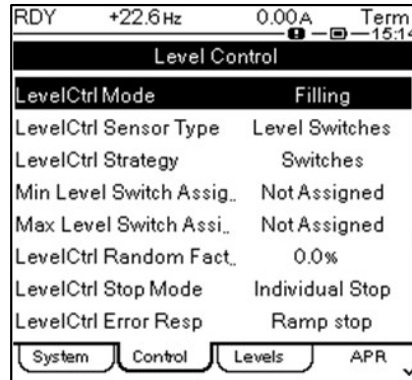
- **Level control settings**

- Select what you want to do



→ To use level control you must activate it first

- Following menus appear according to your choice
- Control and level tab are only available for a master or a potential master



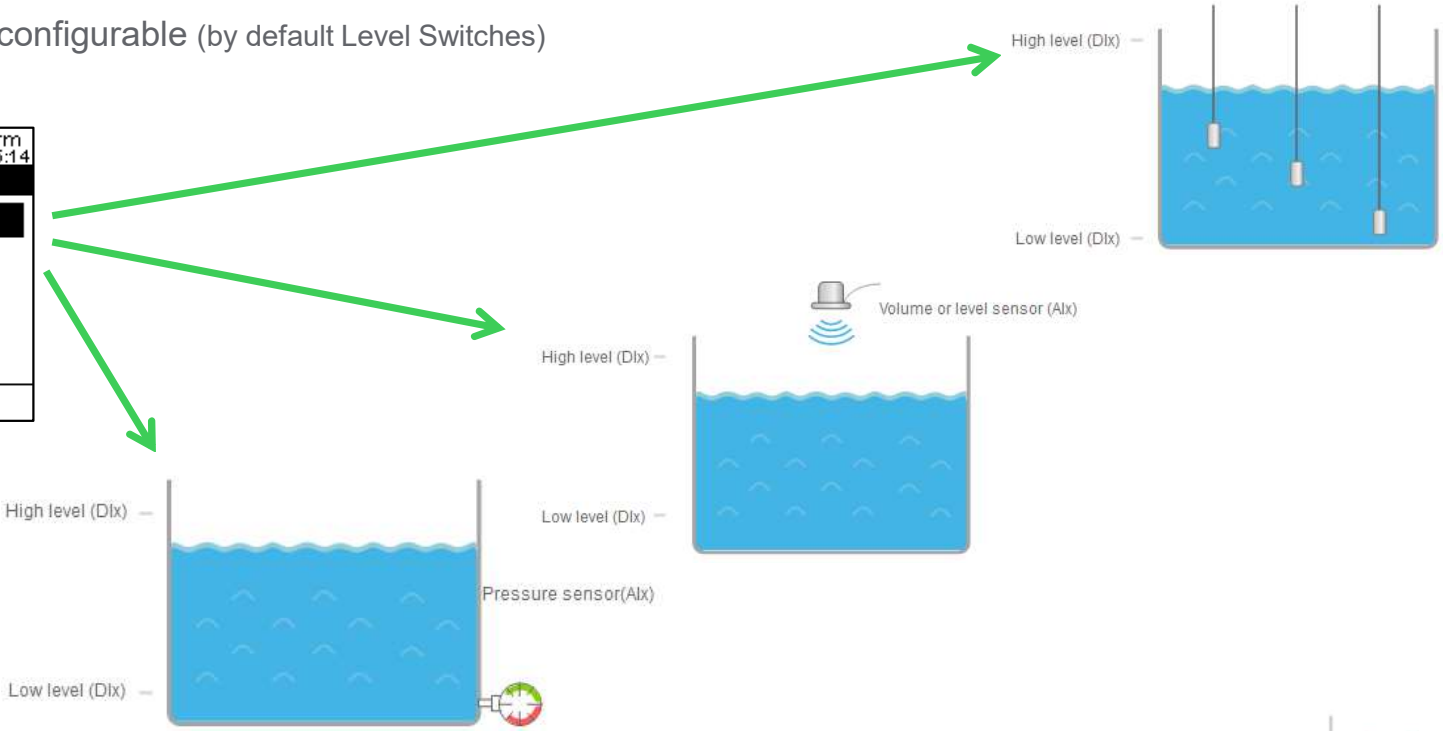
# Level Control

Level control commissioning (Control tab)

- **Level control settings**

- 3 types of sensors are configurable (by default Level Switches)

RDY	+22.6Hz	0.00A	Term
15:14			
LevelCtrl Sensor Type			
Level Switches			✓
Level Sensor			
Pressure sensor			



# Level Control

Level control commissioning (Control tab)

- **Level control number of pumps (same as for Booster)**

- In addition of number of pumps defined in system tab it is possible to define number of pumps used for level control
- **Warning:** Take care it is possible to define something like 3 pumps in the system and 6 used
- With Single drive mode, interlock function must be configured to know if pumps are ready or not
- When 0 is written number of pump defined in system tab is taken into account

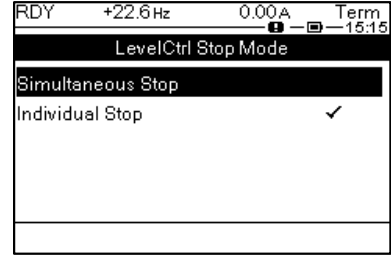
NLP	0.0Hz	0.00A	Term
Level Control			
LevelCtrl Mode	Filling		
LevelCtrl Nb of Pumps	0		
LevelCtrl Sensor Type	Level Switches		
LevelCtrl Strategy	Switches		
LevelCtrl Stop Mode	Individual Stop		
System	Control	Levels	APR

# Level Control

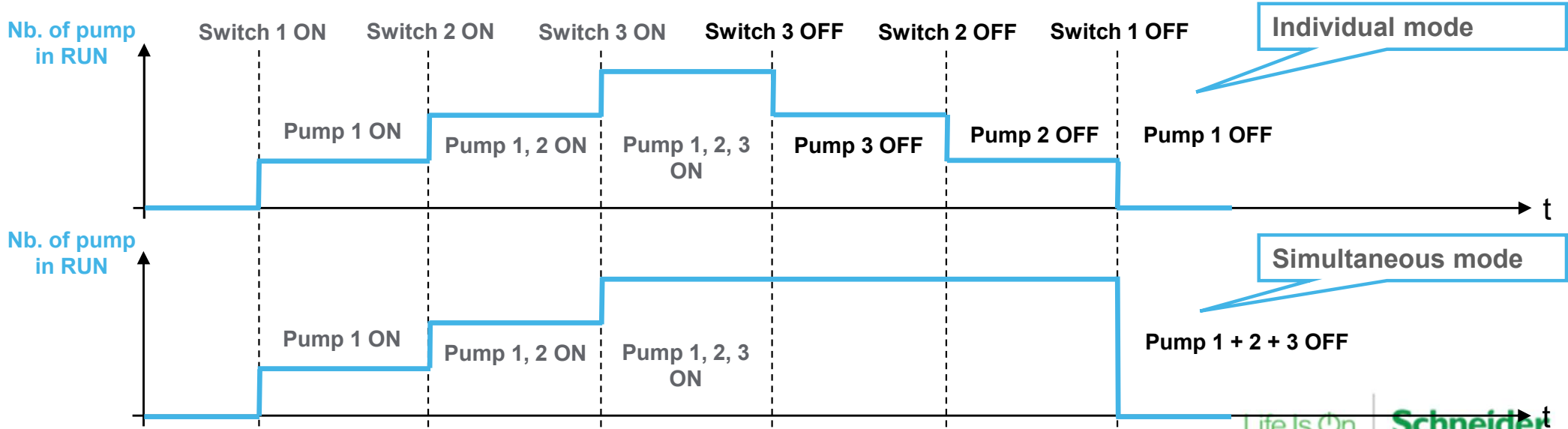
Level control commissioning (Control tab)

- **Level control settings**

- Level control stop mode



- All pumps are stopped with the last switch
- Pumps are stopped individually (default value)



# Level Control

## Level control commissioning (Control tab)

- Level control settings (Level switches)

- **Min** Level switch / **Max** level switch
  - It is always possible to define a Min/Max level managed by switches
  - It is **not mandatory** to have Min/Max switch to run the application

RDY	+50.0Hz	0.00A	Term
-14:15			
Level Control			
LevelCtrl Mode	Filling		
LevelCtrl Nb Of Pumps	0		
LevelCtrl Sensor Type	Level Switches		
LevelCtrl Stop Mode	Individual Stop		
Min Level Switch Assig..	Not Assigned		
Max Level Switch Assi..	Not Assigned		
LevelCtrl Error Resp	Ramp stop		
System Control Levels APR			

- Switches configuration

- Number of switches available in this screen is directly linked to number of pumps defined in System tab **OR** Control tab

RDY	+22.6Hz	0.0Hz	Term
-10:33			
System Architecture			
Pump System Architec..	Single Drive		
Nb Of Pumps	3		
Pumps Configuration			
Pump Cycling Mode	Runtime		
Lead Pump Alternation	No		
System Control Levels APR			

RDY	+50.0Hz	0.0Hz	Term
-17:08			
Level Control			
LevelCtrl Mode	Filling		
LevelCtrl Nb Of Pumps	3		
LevelCtrl Sensor Type	Level Sensor		
Level Sensor Assign	AI2		
AI2 Configuration			
System Control Levels APR			

RDY	+22.6Hz	0.0Hz	Term
-10:13			
Level settings			
Level Switch1 Assign	DI2		
Level Switch2 Assign	DI3		
Level Switch3 Assign	DI4		
System Control Levels APR			

- Switch 1: VSP (On/Off)
- Switch 2: FSP (On/Off)
- Switch 3: FSP (On/Off)

# Level Control

Level control commissioning (Control tab)

- **How does it works with failed sensor(s)?**

- An « **internal drive vote** » is done to define if a sensor is OK or not and **the majority win**
- **Exp.1:** 3 sensors, emptying mode and **switch 1 is out of order:**
  - Switch 1 level is reached → No action
  - Switch 2 sends back logical information → Pump 1 and 2 are started
  - Switch 3 sends back logical information → Pump 3 is started
- **Exp.2:** 3 sensors, emptying mode and **switch 1 and switch 2 are out of order:**
  - Switch 1 level is reached → No action
  - Switch 2 level is reached → No action
  - Switch 3 sends back logical information → No action

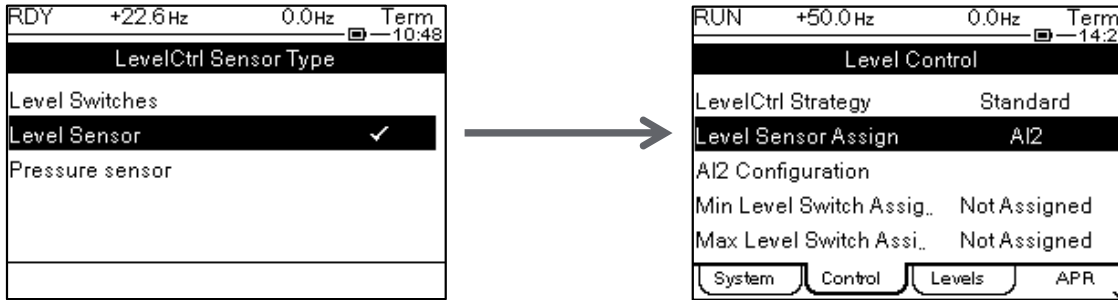
**As switch 3 is not consistent with switch 1 and 2, this one is considered as out of order**

# Level Control

Level control commissioning (Control tab)

- **Level control settings (level sensor)**

- In this mode an **analog input must be configured**



- **Warning** with analog input scaling, **do not forget units**

AI2 Configuration	
AI2 Type	Voltage
AI2 Min. Value	0.0v
AI2 Max value	10.0v
AI2 Lowest Process	0
AI2 Highest Process	+1500

→ Min value of this sensor is 0 meter  
→ Max value of this sensor is 15,00 meters

# Level Control

Level control commissioning (Control tab)

- **Level control settings (level sensor)**

- Empty Tank Level / Full Tank Level
  - Define here in meters low and high limit of the tank
  - **Warning:** you enter here sensor feedback values corresponding to high and low limit for the tank
- In **filling mode** as soon as the sensor reach the value “Full Tank Level” → « High Level Error » is managed
- In **emptying mode** as soon as the sensor reach the value “Empty Tank Level” → « Low Level Error » is managed
- Level Control Strategy and Level Control Low Speed
  - See explanations after

Level Control	
LevelCtrl Mode	Filling
LevelCtrl Nb Of Pumps	0
LevelCtrl Sensor Type	Level Sensor
LevelCtrl Strategy	Standard
Level Sensor Assign	AI2
AI2 Configuration	
Min Level Switch Assig..	Not Assigned
Max Level Switch Assi..	Not Assigned
LevelCtrl Low Speed	35.0Hz
LevelCtrl Random Fact..	0.0%
Empty Tank Level	+1.00m
Full Tank Level	+10.00m
LevelCtrl Error Resp	Ramp stop

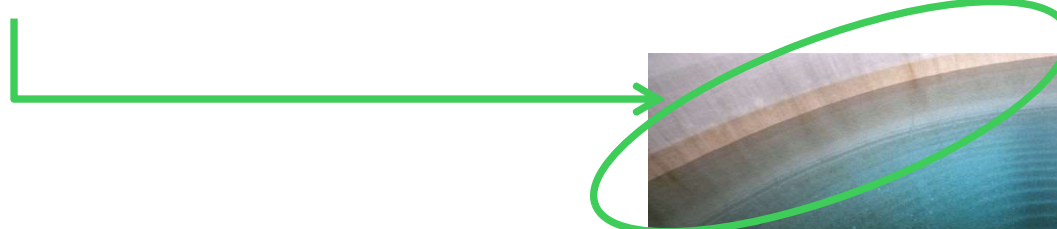
# Level Control

Level control commissioning (Control tab)

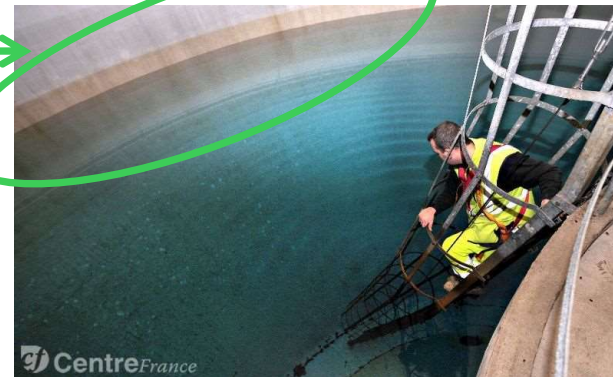
- **Level control settings (level sensor)**

- Level Control **Random Factor**

- A random level factor can be set to reduce sedimentation accumulation at the liquid surface level
- The random factor is **applied on the variable speed pump**



- Enter a **percentage** of « **Full Tank Level** »
- **Take care** it is possible to enter **crazy values** like 100%



# Level Control

Level control commissioning (Levels tab)

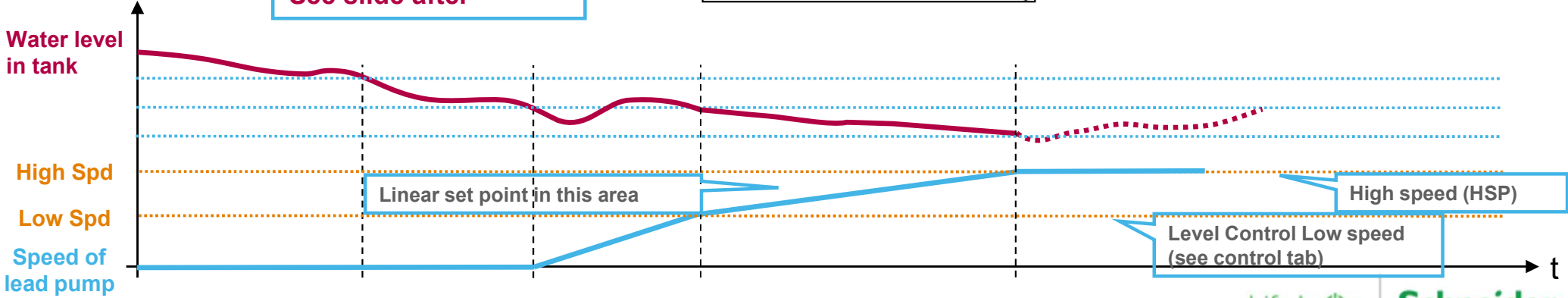
- **Level control settings (level sensor)**

- Define in this screen all your intermediate levels
- Example in filling mode single drive mode:

RDY	+50.0Hz	0.0Hz	Term
Level settings			
Level 1st Pump Start	80.0%		
Level 1st Pump Stop	100.0%		
Level 1st Pump at HSP	60.0%		
Level 2nd Pump Start	50.0%		
Level 2nd Pump Stop	80.0%		
System	Control	Levels	APR

**Take care, no check done by the drive. It is possible to enter crazy configuration See slide after**

- Start pump 1 when level is at 80%
- Stop pump 1 when level is at 100%
- Adjust set point between 80% → 60%



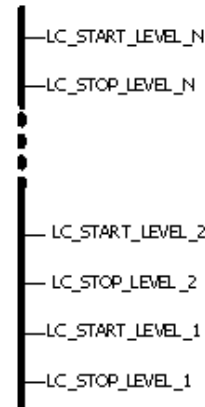
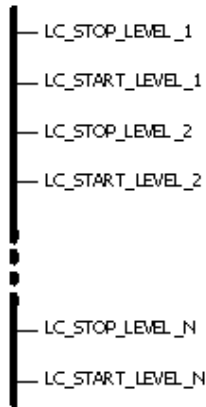
# Level Control

Level control commissioning (Levels tab)

- **Level control settings (level sensor)**

- **How to define a level:** Percentage value entered in Start and/or Stop level is a percentage between « Empty tank level » and « Full tank level »
- Example: “Empty tank level” = 1,5m and “Full tank Level” = 8,5m  
To define an intermediate level at 7m:  
 $(7,0m - 1,5m) / (8,5m - 1,5m) = 78.6\%$
- It is mandatory to do not overlap pump ranges:

When mode is configured to **filling** or When mode is configured to **emptying**



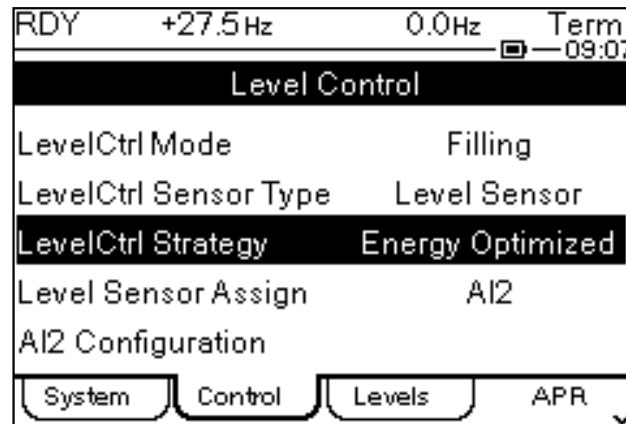
# Level Control

Level control commissioning (Control tab)

- **Level control settings (level sensor)**

- **Energy optimisation**

- The advantage of this strategy is that the pumps run always at the optimal point during the filling and emptying process
- The strategy “**ADVANCED**” can be selected if the [pump curves have been entered previously](#) by the user (i.e. **MODE = PHQ**)



# Level Control

Level control commissioning (Control tab)

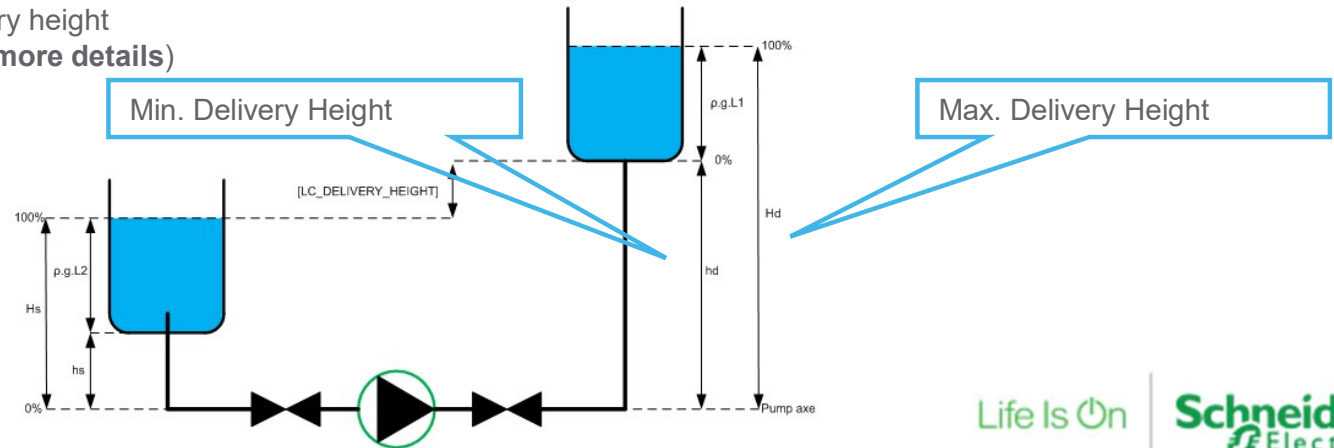
## • Level control settings (level sensor)

- Energy optimisation
  - To perform this strategy, following data are required:
    - Validated pump curve characteristic
    - The system flow (measured or estimated)
    - The tank volume
    - The minimum and maximum delivery height (see the programming guide for more details)

RDY	+27.5Hz	0.0Hz	Term
08:57			
Level Control			
Tank Volume	0.0m <sup>3</sup>		
LevelCtrl Random Fact.	0.0%		
Empty Tank Level	+1.00 m		
Full Tank Level	+10.00 m		
Min Delivery Height	0.00m		
System		Control	Levels
		APR	▼

Exp.:

**Pumps and motors must be identical**



# Level Control

Level control commissioning (Control tab)

- **Level control settings (level sensor)**

- Energy optimisation

- **Disturbance Flow compensation**

- This parameter allow to compensate more or less the estimated disturbance flow

- **Warning:** impact on the energy optimisation

- Disturbance flow is estimated according to pump system flow and tank characteristic (volume entered)

- The disturbance flow is continuously estimated when the system is in RUN

- **Disturbance Flow response time**

- Allow to adjust system reactivity to compensate the disturbed flow estimated

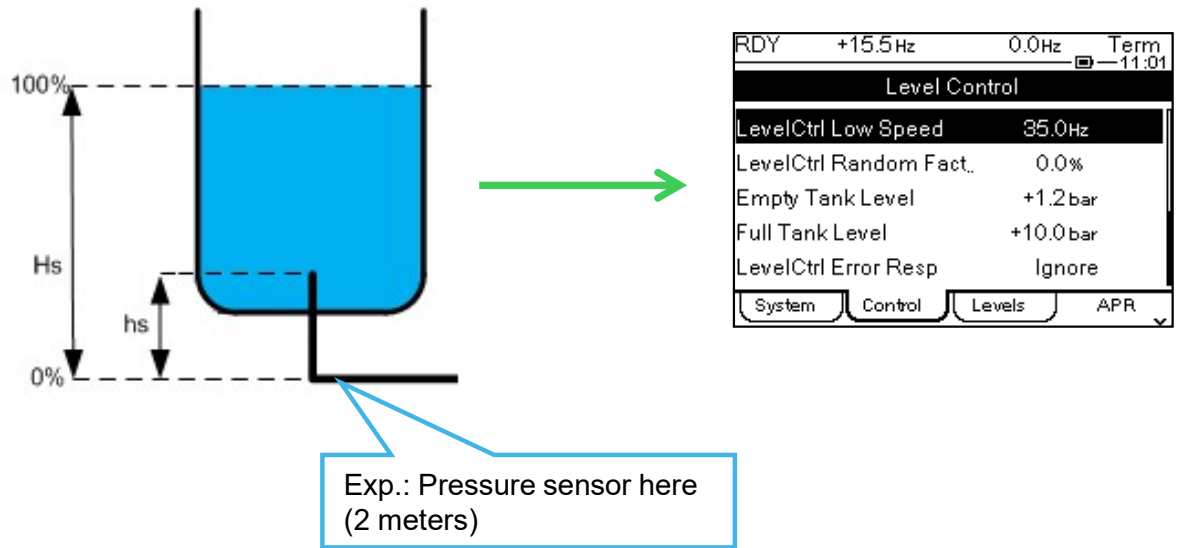
- **Warning:** an out of scope value can result some instabilities or bad energy management

# Level Control

Level control commissioning (Control tab)

- **Level control settings (Pressure sensor)**

- The tank level measurement is deduced from analog pressure sensor
- The pressure sensor can be placed at different height (+/-)



→ Sensor height integrated here