Digital Twin for a WWTP

Magnus Emanuelsson

Roslagsvatten

Magnus.emanuelsson@roslagsvatten.se

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Roslagsvatten - RV

- Ltd, 7 municpalities
- 170 employees
- Main offices Åkersberga
- Distribution of drinking water and collection and treatment of sewage to 130 000 p

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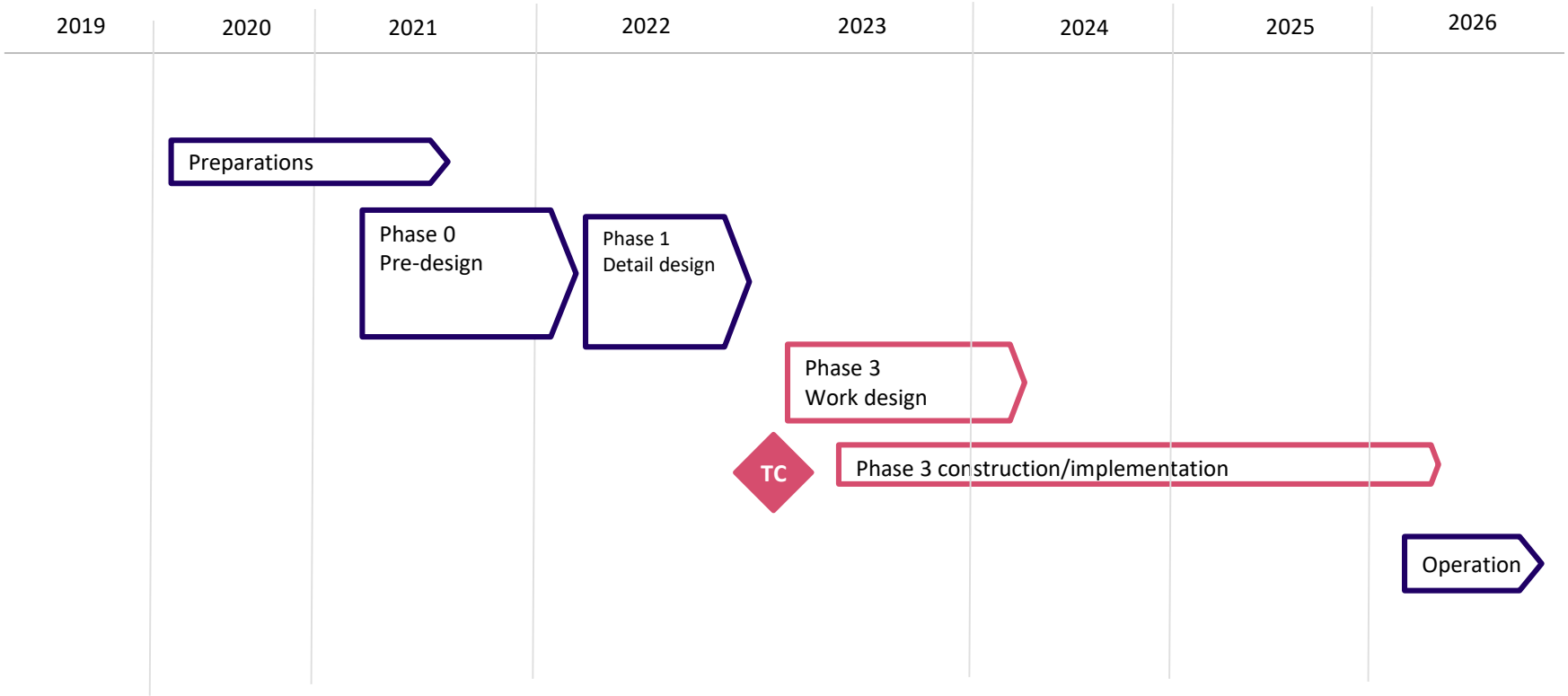
A new WWTP plant at Margrelund 93 000pe

Main implementation plan – partnering



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Why digitalisation for RV

- Easy to find information for the whole company
  - Documentation, drawings, spare parts, pictures, instructions available to all departments
- Easy to move Information
  - All system and departments have access to the same information.
- Easy to visualize and read
  - Readings in real time, trends both financial and operations, prognosis to detect operation problems, maps, reports etc

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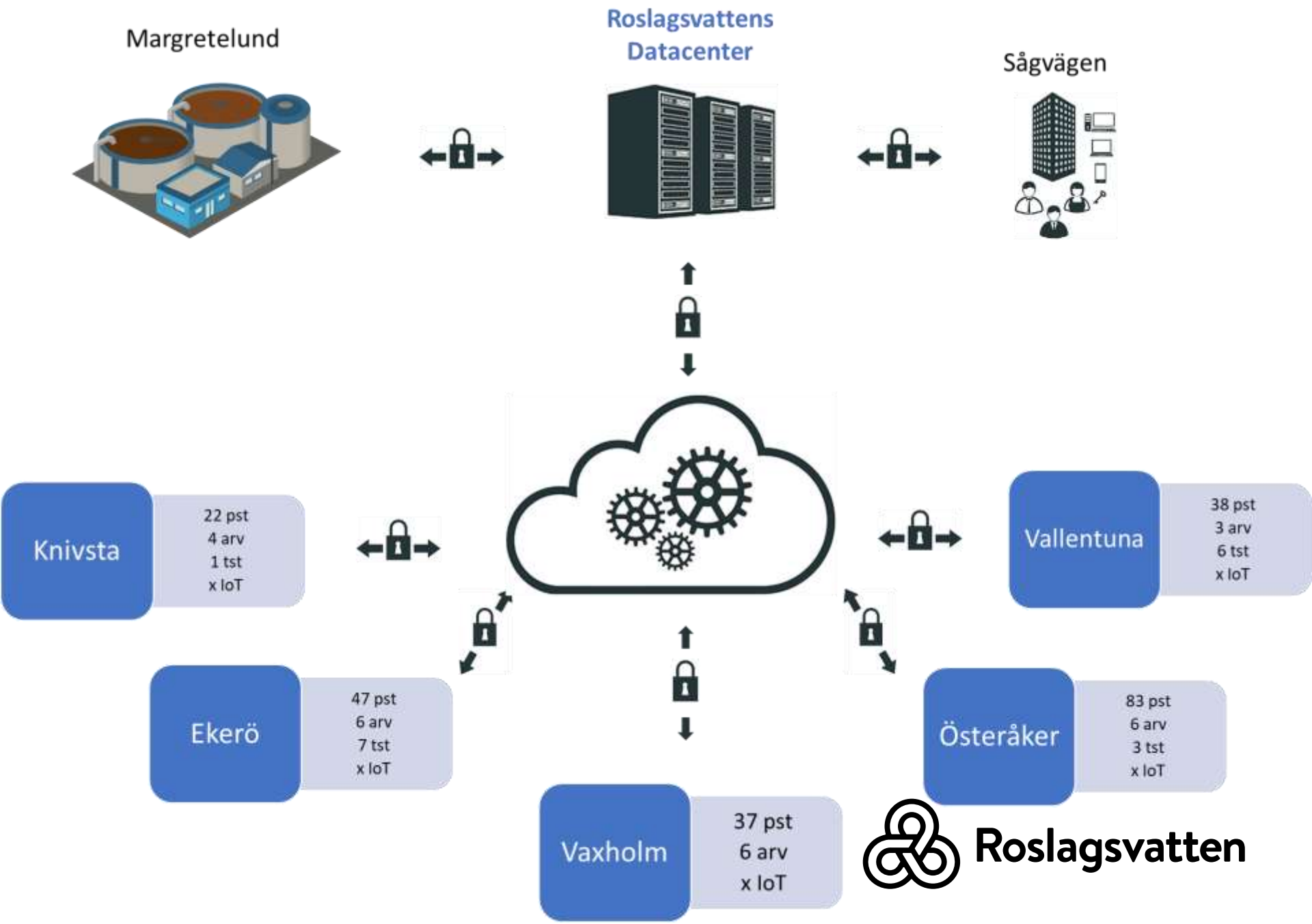
Margretelund
Roslagsvattens Datacenter
Sågvägen
Knivsta
22 pst
4 arv
1 tst
x IoT
Vallentuna
38 pst
3 arv
6 tst
x IoT
Ekerö
47 pst
6 arv
7 tst
x IoT
Österåker
83 pst
6 arv
3 tst
x IoT
Vaxholm
37 pst
6 arv
x IoT
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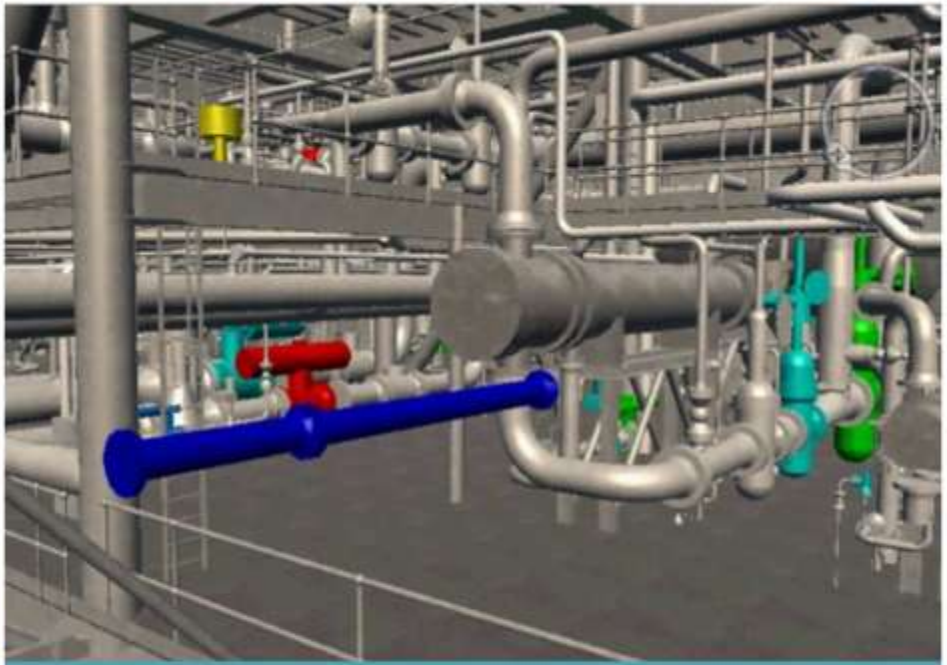
Planning:
Where is the system to be commissioned?



Commissioning Status Check:
What has been already commissioned?

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The implementation

The new WWTP at Margretelund will be used to create the first step of digitalisation for Roslagsvatten

- The design will be using 3D models to create a digital twin
  - A digital prototype of the WWTP
  - Including all information in the objects in the model
- “As built drawings” will be “a form of a digital twin“

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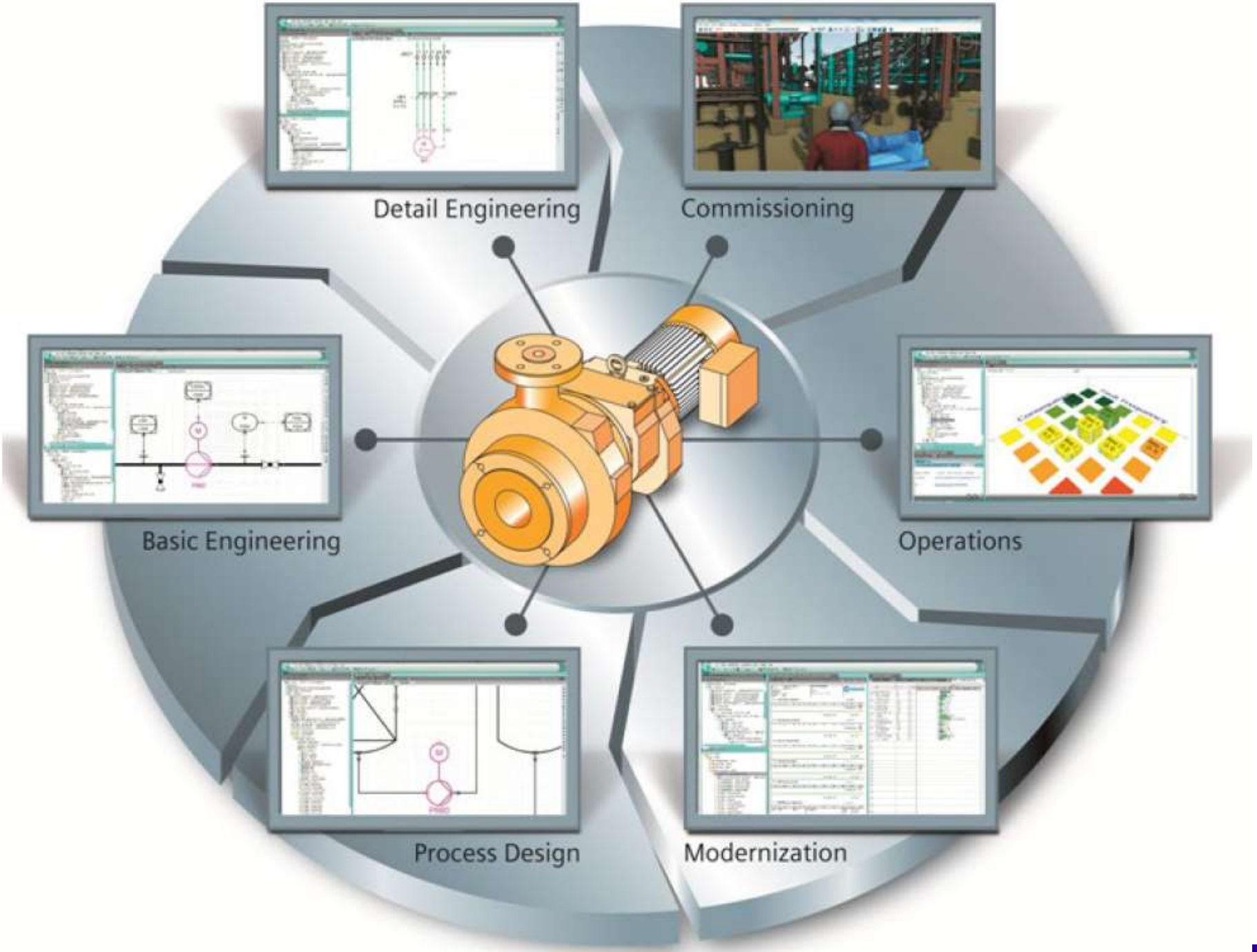
Detail Engineering
Commissioning
Basic Engineering
Operations
Process Design
Modernization

3D Overview
Operational KPIs Status Indicators
1D and 2D Viewers
InTouch OMI Navigation Tree
Live Process Graphics
Alarm Grid
"Live" camera feed
TITLE
19.0
9.00
0.000
50.4

How do we build this?

- Strategy for the OE-ET platform
  - Document standard, BIM/CAD, Control System, GIS, etc
- BIM (Building Information Modelling)
  - Roslagsvatten standards.
- A DIGITAL Twin test at a small WWTP
  - How to use a “simulation tools” for the operation of the WWTP

Involving the personal and changing the organisation

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Strategy of the OE-ET platform

"*Build from bottom to the top not the other way around*"

- How do we make sure every system communicates

  Standards, standards, standards.

  – Standards for Communication, standards for structures, standard for interoperability

- **The key factor is to early decide:**
  – Naming standard
  – Data structures
  – Communication protocols
  – Open and international standards

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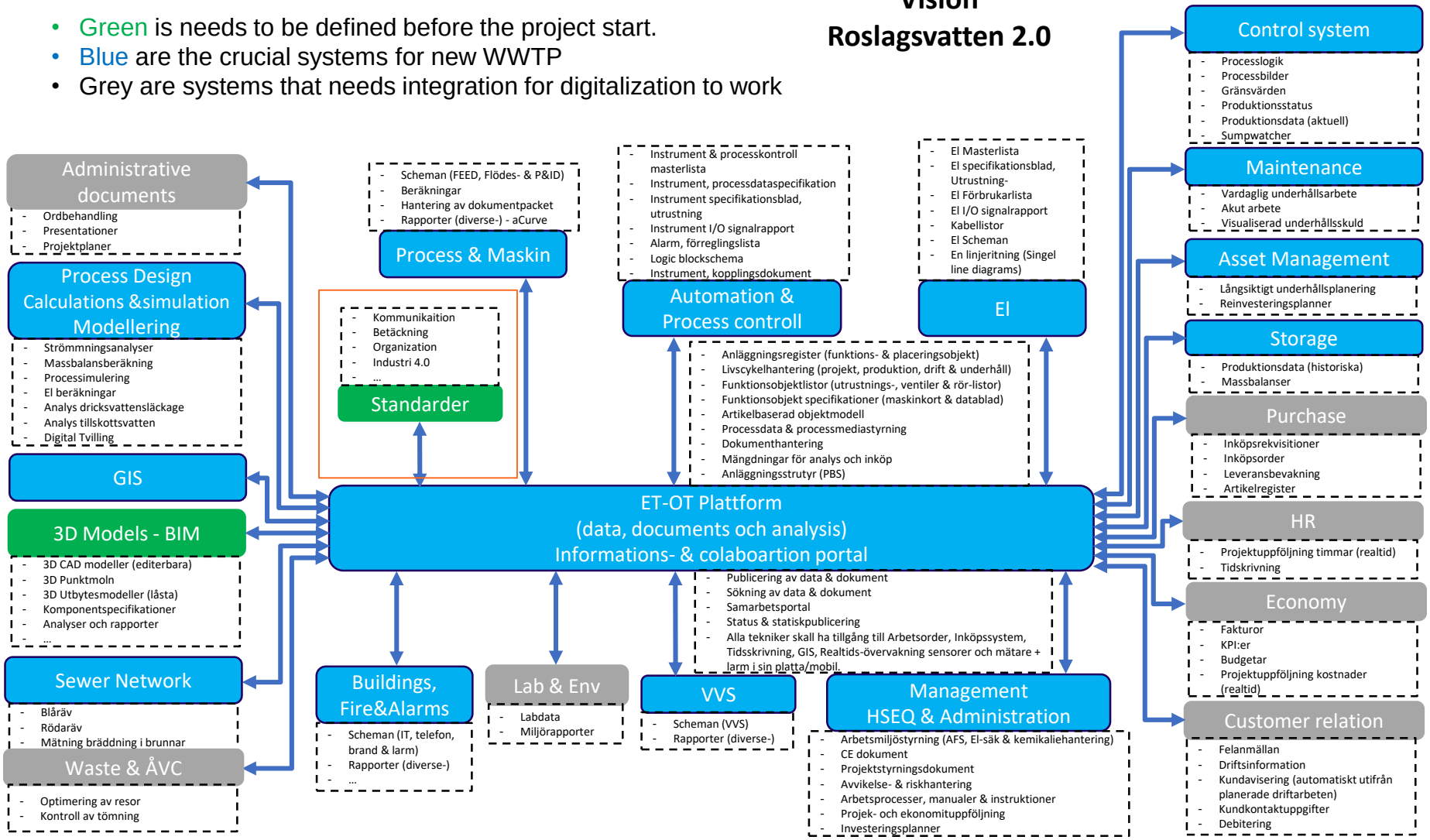
Vision
Roslagsvatten 2.0

- Green is needs to be defined before the project start.
- Blue are the crucial systems for new WWTP
- Grey are systems that needs integration for digitalization to work



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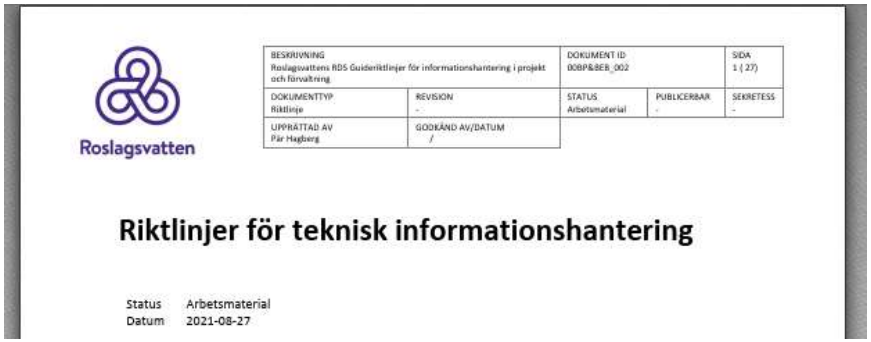
The Standards



BESKRIVNING		DOKUMENT ID		SIDA
Roslagsvattens RDS Guideriktlinjer för informationshantering i projekt och förvaltning		00BP&BEB_002		1 (27)
DOKUMENTTYP	REVISION	STATUS	PUBLICERBAR	SEKRETESS
Riktlinje	-	Arbetsmaterial	-	-
UPPRÄTTAD AV	GODKÄND AV/DATUM			
Pär Hagberg	/			

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Riktlinjer för teknisk informationshantering

Status Arbetsmaterial
Datum 2021-08-27

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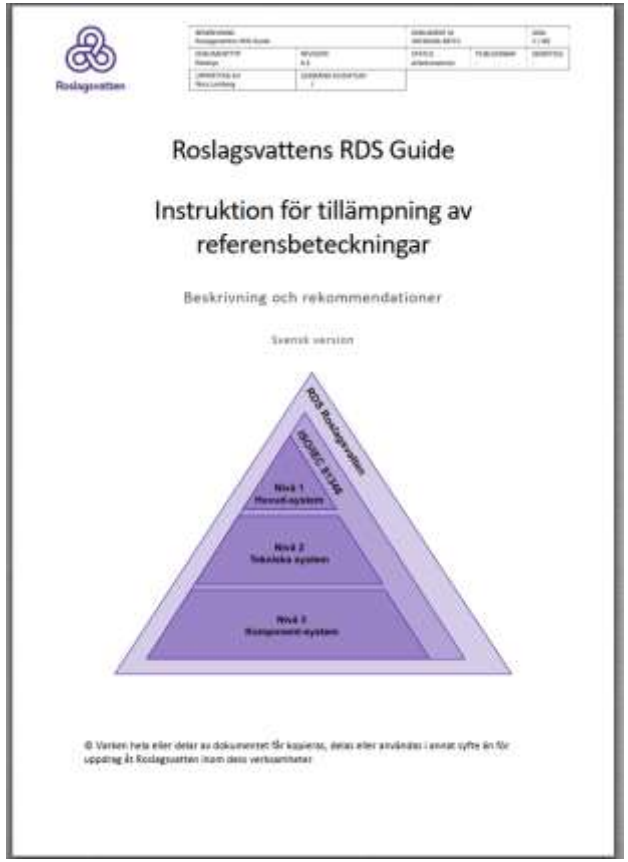
BIM-Manual

00BP&BEB_001

Status Arbetsmaterial
Datum 2021-08-27



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Roslagsvattens RDS Guide

Instruktion för tillämpning av referensbeteckningar

Beskrivning och rekommendationer

Svensk version

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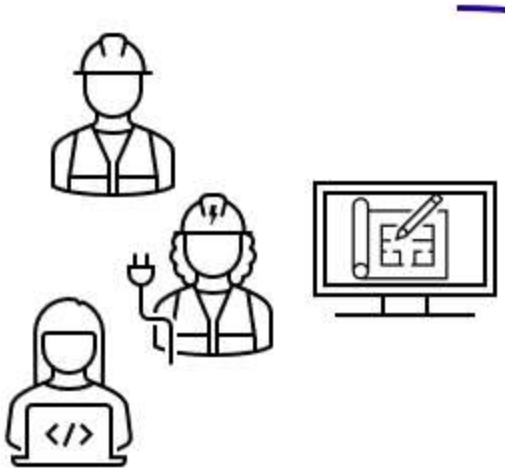
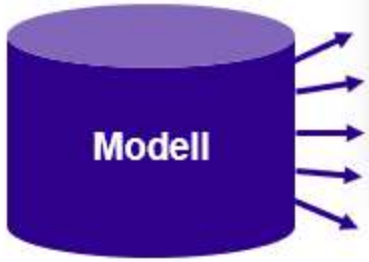
”BIM ” *to group information into objects*

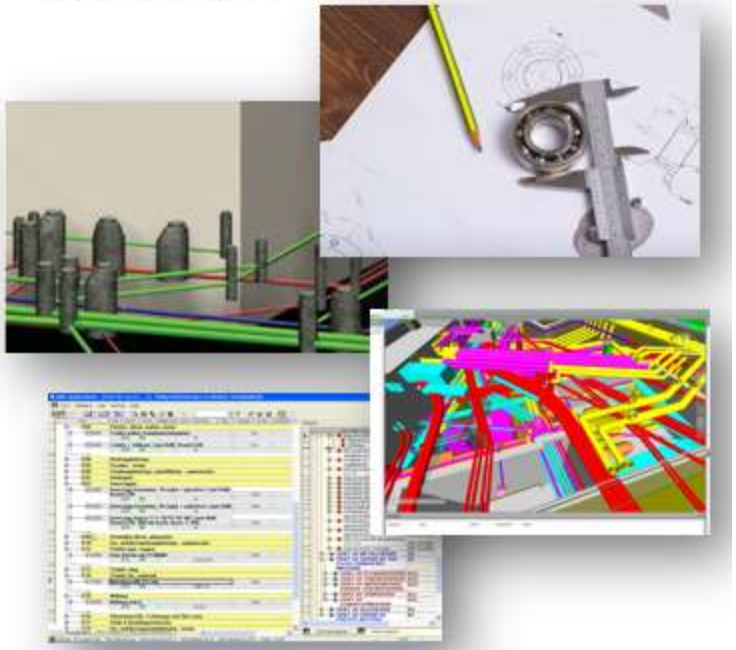
Projectors create information during the design



The information are stored into databases or models



The information can be presented into different user interfaces



BIM is NOT a 3D-model

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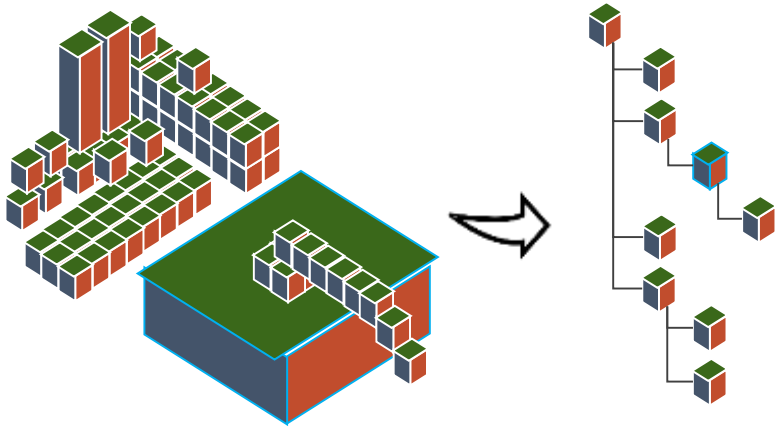
The RDS manual

- RDS (Reference Designation System) defines the rules for how the objects are
  - structured and organized
  - Classified and named



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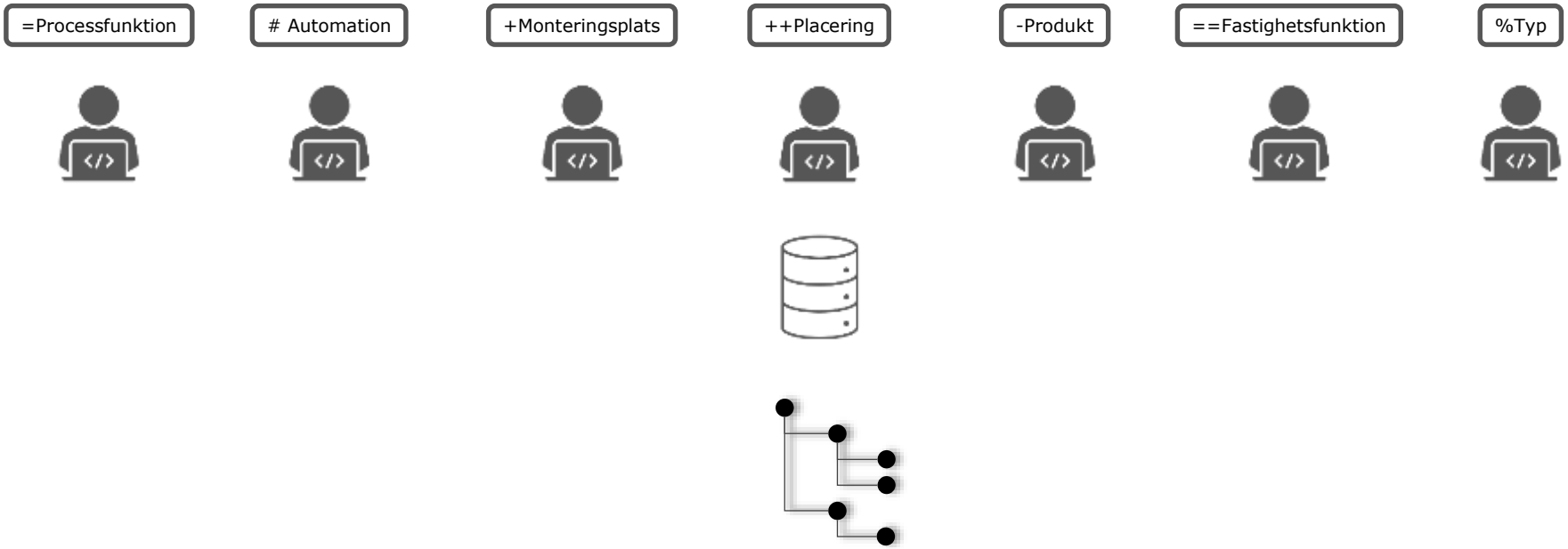
ISO/IEC 81346 | One structure to rule them all – ONE COMMON LANGUAGE



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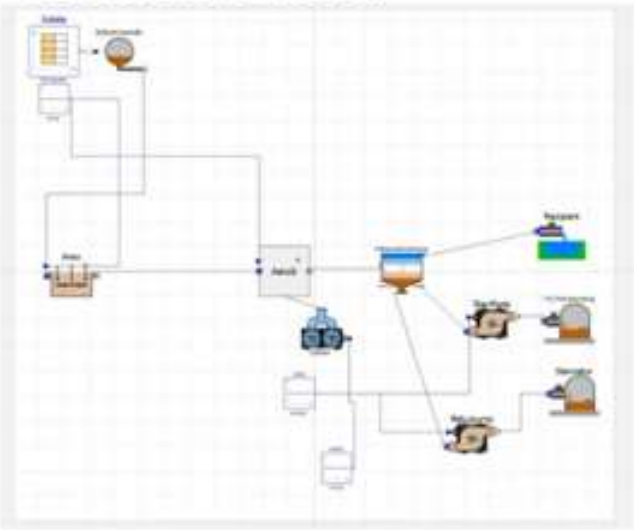
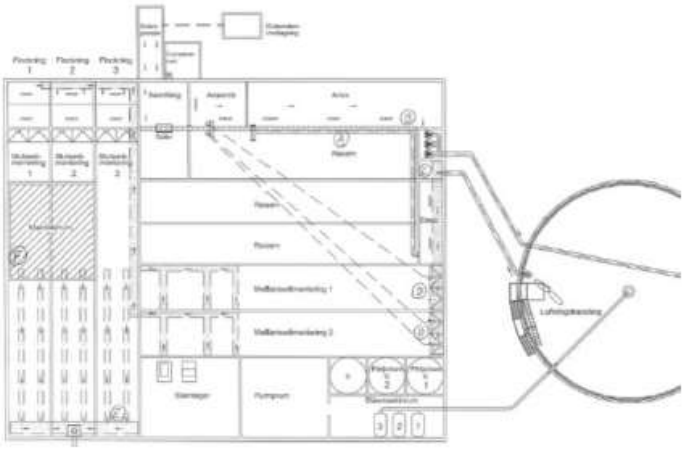
Simulation of operation results using a digital twin at Ekebyhov WWTP

- Challenges (model no1/2)
  - Verifying and calibrating the model requires a very large number analyses need (more than 72 settings) and very qualified personal.
- The aim of the project
  - Can a standards settings and operation data in a model help the operation and planning of changes.

Openmodelica modell





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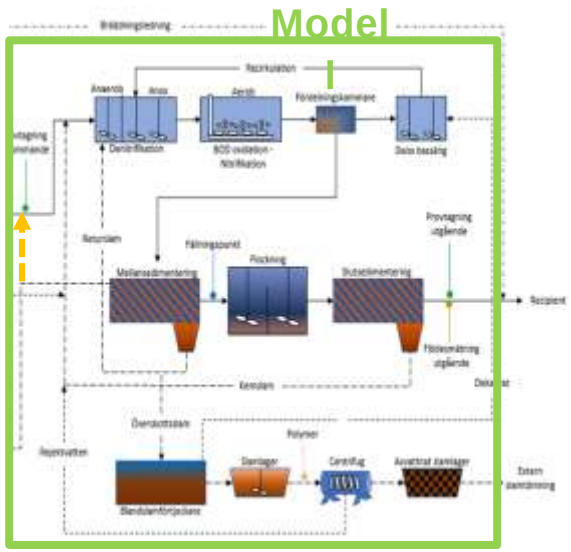
The digital twin project at Ekebyhov WWTP

- Model predictions when using normal influent sampling and operation data

Inflow	
Q (m3/h)	197
NH4-N (mg/l)	29
Tot-N (mg/l)	79
Tot-P (mg/l)	7,1
SS	0
COD	530



(Effluent)	Mod ell	Actual value
COD (mg/l)	156	76
NH4-N (mg/l)	0.9	6,2
Tot-N (mg/l)	37	15
Tot-P (mg/l)	6.2	0,2
SS	121	5,0

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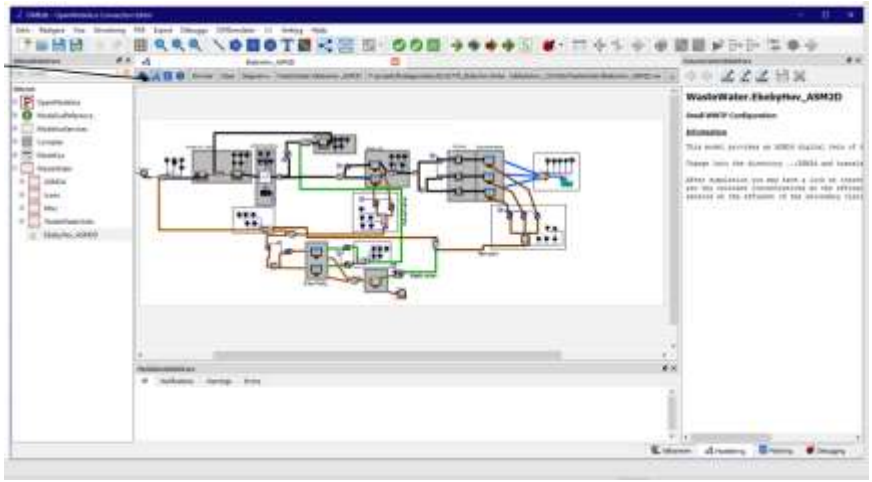
The digital twin project at Ekebyhov WWTP

- The model have been handed over to RV personal for further evaluation in June 2021



- Observations until oct 2022
  - It can give indications for process discussions
  - A training tool
  - Further evaluation and the use of a on-line sensor (flow) are planed during 2021

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Lessons learned

- Start with the cornerstones
  - Designated project management, organisation and budget
  - Involve and train the organisation
  - Develop and implement company standards VITAL naming standard
  - BIM
- No results without input !
  - Advanced simulation requires a lot of effort and budget
  - With standards settings it can be used for indications and training

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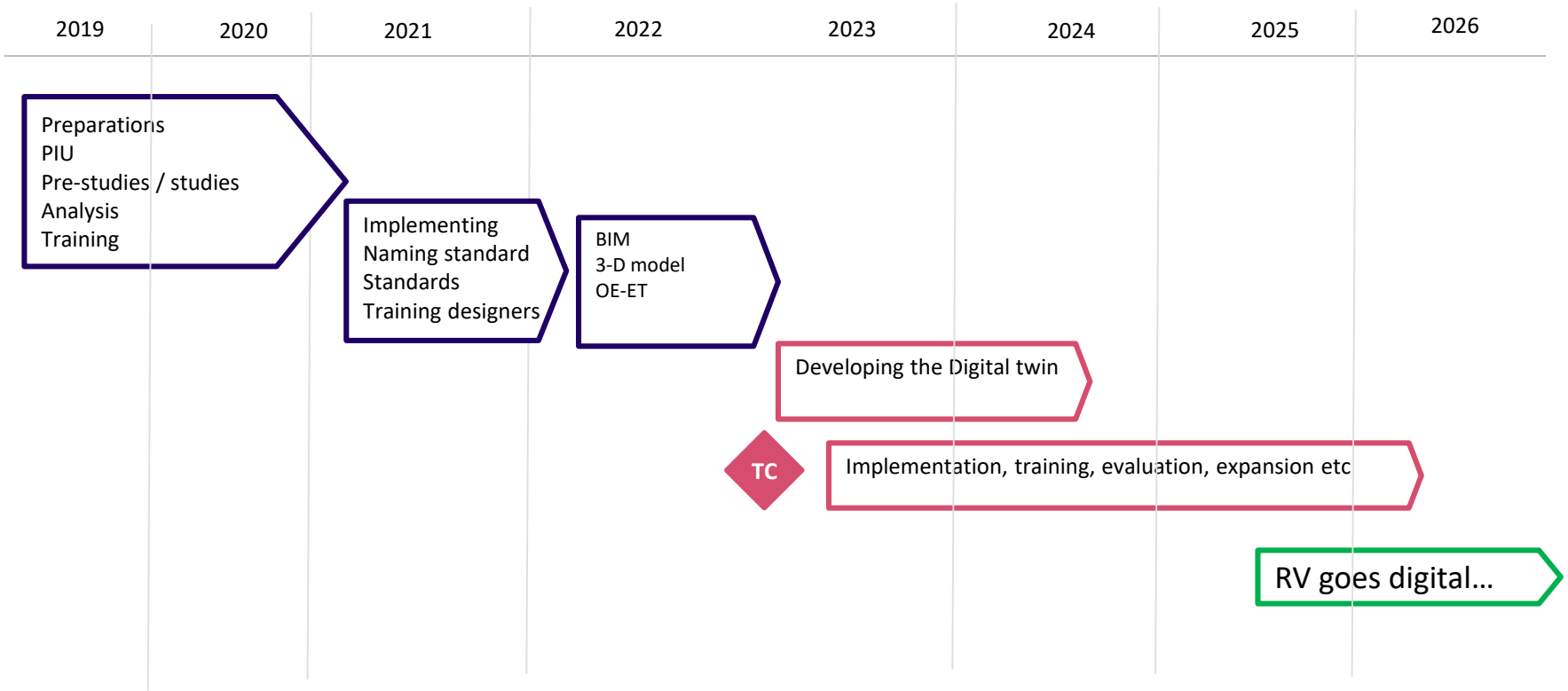
But with time and planning hopefully…!



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Thank you for your attention

Magnus Emanuelsson

Roslagsvatten

Magnus.emanuelsson@roslagsvatten.se

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More Information

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jaspersnetwork@eib.org

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