

Technical Monitoring

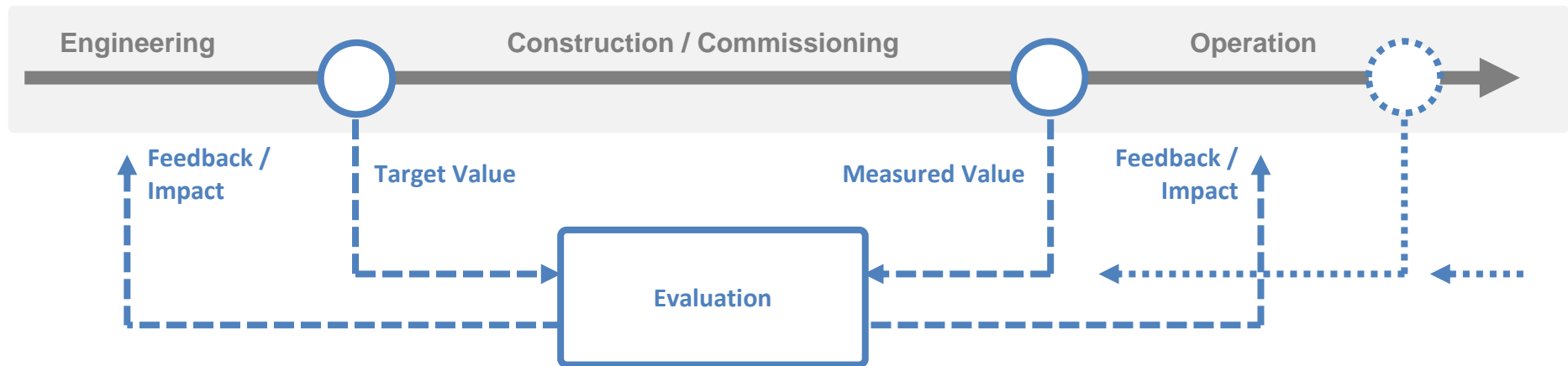
Workshop n. 11 - BACS supported performance,
technical monitoring and certified commissioning of HVAC systems

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**Smart Buildings
don't work
by itself!**

— Quality Control Loop



— Technical Monitoring

1



Digital Engineering

Specification
of building functions

2



Analyses

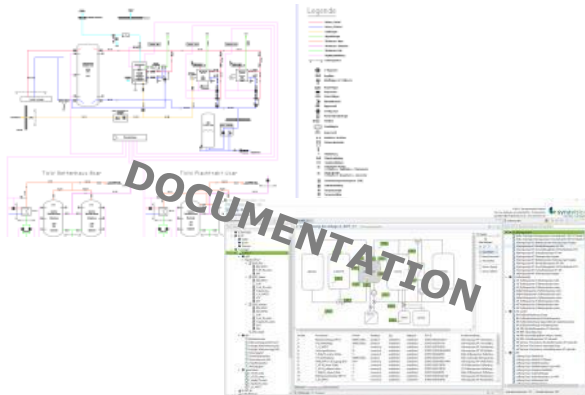
Automated
mass data analysis

3

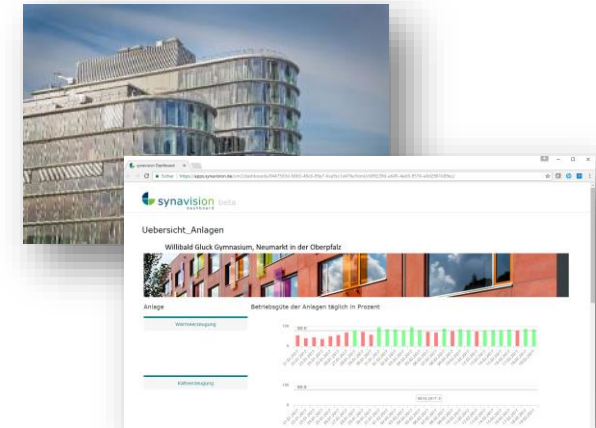


Monitoring

Continuous monitoring of
building performance



Datenpunktadresse	DP_ID_001	DP_ID_002	DP_ID_003
Klartext	Zählerstand	Wirkleistung	Vorlauftemp
Einheit	m3	kW	°C
01.01.2014 22:00	14375	17,4	47,5
01.01.2014 22:15	14378	18,3	49,2
01.01.2014 22:30	14381	16,4	48
01.01.2014 22:45	14386	18,9	47,6
01.01.2014 23:00	14387	7,3	46,2
01.01.2014 23:15	14393	6,9	48,1





**Technical
Monitoring
is digital!**

— AMEV Recommendation 135 „Technical Monitoring“



- Set Targets
- Provide Data
- Evaluate Performance
- Impact

→ **Third Party Quality Management Service**

— REHVA Guidebook

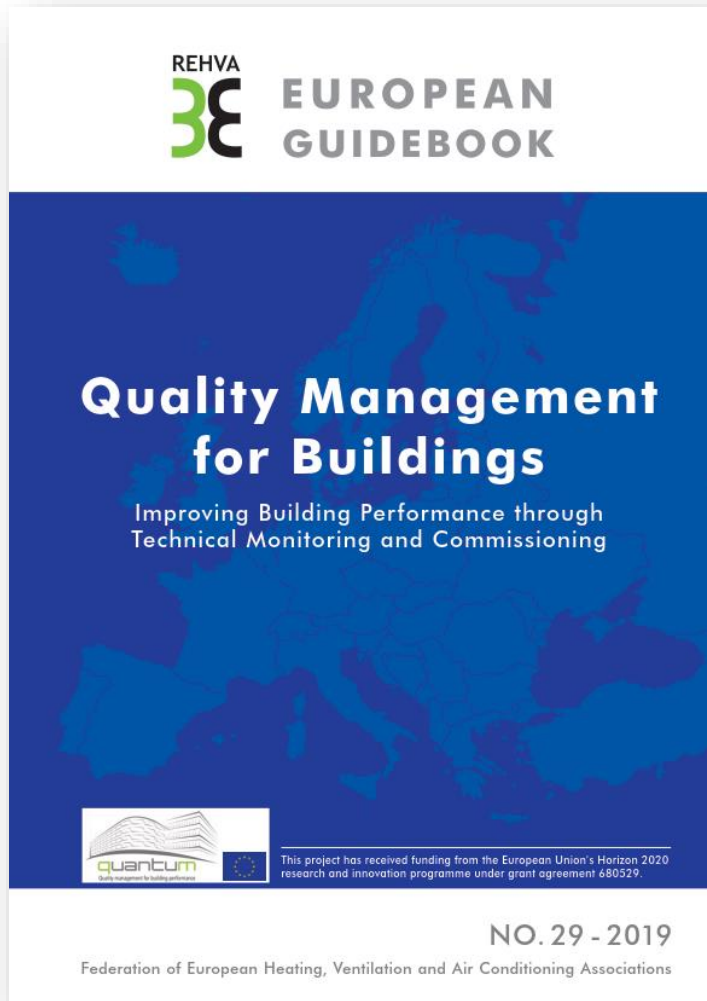
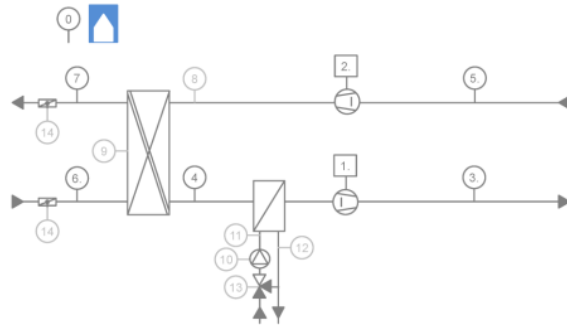


Table 3. Comparison TMon and Cx (OPR: Owners Project Requirements, BoD: Basis of Design).

	TMon	Cx	TMon + Cx
Nomination of aCx service provider	Contract service provider	Contract service provider	Contract service provider
OPR		Write OPR with Building Owner or give guidance to Building Owner	Write OPR with Building Owner or give guidance to Building Owner
BoD		Give guidance to Design Engineers for writing BoD and check BoD on compliance with OPR	Give guidance to Design Engineers for writing BoD and check BoD on compliance with OPR
Commissioning plan	Describe TMon / Cx Process in the project		Describe TMon / Cx Process in the project
Cx in the Design Phase	Derive target values for building and system operation and specify testing procedures		Derive target values for building and system operation and specify testing procedures
Cx in the Construction Phase		Check Design on compliance with OPR	Check Design on compliance with OPR
		Check Construction on compliance with OPR	Check Construction on compliance with OPR
Cx in the Startup Phase	Check data from trial operation against target values and report		Check data from trial operation against target values and report
		Check start up procedures, prerequisites for testing systems functions and cross system functions and report	Check start up procedures, prerequisites for testing systems functions and cross system functions and report
O&M Manual, Systems Manual		Review O&M and system manuals on completeness, timeliness, consistency and plausibility	Review O&M and system manuals on completeness, timeliness, consistency and plausibility
Training for O&M Personnel		Check schedule and execution of training	Check schedule and execution of training
Training for building occupants during operation		Check schedule and execution of training	Check schedule and execution of training
Commissioning in building operation	Check data from ongoing operation against target values and report		Check data from ongoing operation against target values and report

REHVA Guidebook

Ventilation system



Nr.	Audit value Ventilation system with heat recovery and air heater (to be taken into account with a nominal volume flow > 4000 m³/h)	Target value	Measurement	[Unit]	Annotation
-	Specific fan performance supply/return air	Maximum value	Calculation	[W/m³/s]	Evaluation according to classifications DIN EN 16798-3
-	Degree of temperature change through heat recovery	Setpoint	Calculation	[-]	Calculation according to EN 308
0	Outdoor air temperature	-	Measurement	[°C]	Weather station; possibly additional conversion for controls, e.g. as moving average
1.1/2.1	Electric recorded fan power supply/return air	Maximum value	Measurement	[kW]	-
1.2/2.2	Total pressure difference from supply/return air fan	Setpoint and tolerance	Measurement	[Pa]	Setpoint possibly as characteristic curve with tolerance
1.3/2.3	Electr. energy consumption of supply/return air fan	Maximum value	Meter reading	[kWh]	Evaluation as monthly or annual values
3.1	Supply air temperature	-	Measurement	[°C]	Setpoint possibly as characteristic curve with tolerance
4	Supply air temperature after heat recovery	Min./max. value	Measurement	[°C]	Setpoint possibly as characteristic curve for temperature difference
5.1	Return air temperature	Setpoint and tolerance	Measurement	[°C]	Setpoint possibly as characteristic curve with tolerance
6.1	Outdoor air temperature	-	Measurement	[°C]	-
7	Exhaust air temperature	Min./max. value	Measurement	[°C]	Setpoint possibly as characteristic curve for temperature difference
3.2/5.2	Volume flow supply/return air	Setpoint and tolerance	Measurement	[m³/h]	Setpoint possibly as characteristic curve with tolerance
5.3	CO₂ concentration of return air	Setpoint and tolerance	Measurement	ppm	(optional) Application when controlled via CO₂ concentration
8	Outdoor temperature before heat recovery	-	Measurement	[°C]	(optional)
9	Operating message - heat recovery	-	Measurement	[0/1]	(optional)
10	Operating message - air heater pump	-	Measurement	[0/1]	(optional) Audit of continuous operation
11	Supply temperature of air heater	Setpoint and tolerance	Measurement	[°C]	(optional) Setpoint possibly as characteristic curve with tolerance
12	Return temperature of air heater	Setpoint and tolerance	Measurement	[°C]	(optional) Setpoint possibly as characteristic curve with tolerance
13	Control signal air heater valve	-	Measurement	[%]	(optional)
14	Operational signal - exhaust damper	-	Measurement	[0/1]	(optional)
15	Thermal energy - air heater	Minimum value	Meter reading	[kWh]	(optional)

- Standard definition for minimum systems instrumentation
- Predefines set of target values and operation data



Technical Monitoring makes buildings perform!