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Misure Fiscali

Milan, 25 October 2018

Auditorium TECNIMONT

Best Practice in the Engineering of the Metering Systems

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Best Practice in the Engineering of Metering Systems

Best Practice:

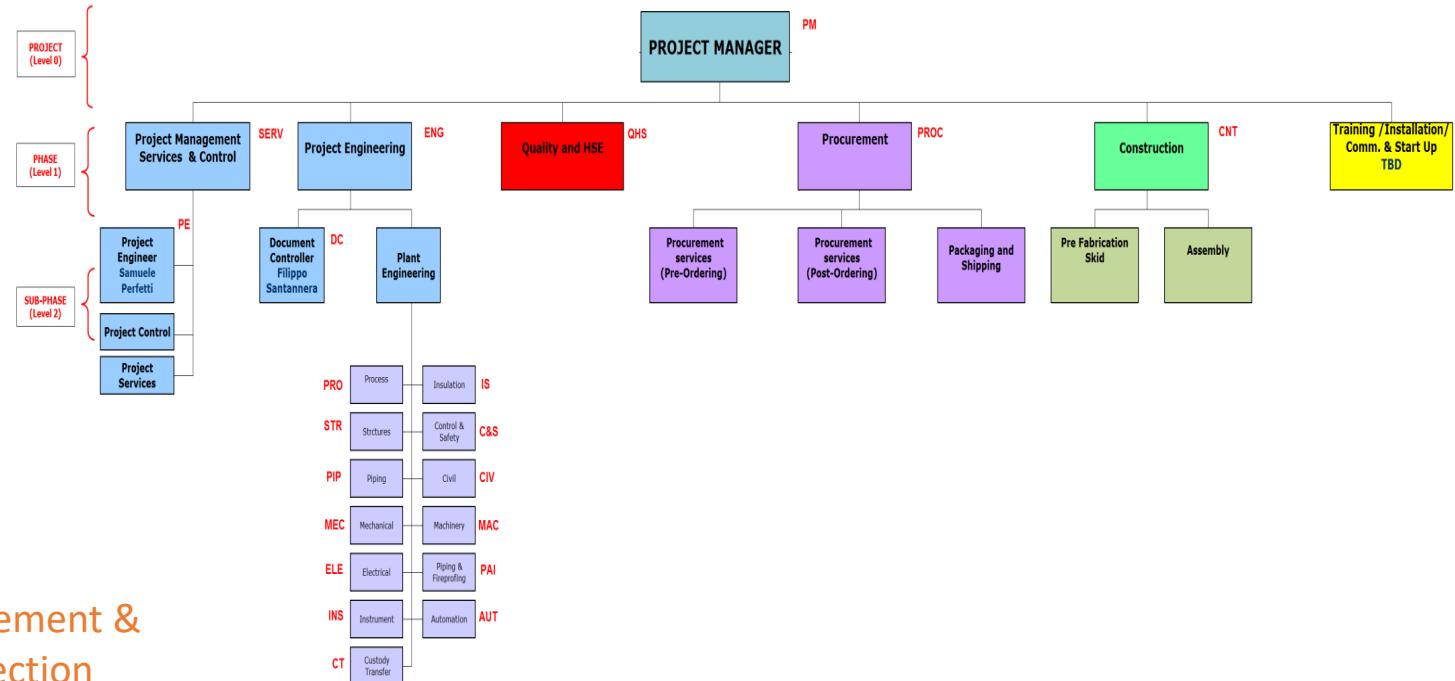
Collection of technique, solutions, procedures or methodology not limited to technical disciplines that, through experience and research, has proven to reliably lead to a desired result.

Metering System:

an assemblage or combination of things or parts
based on multiple disciplines and know how
forming a complex or unitary whole of measure

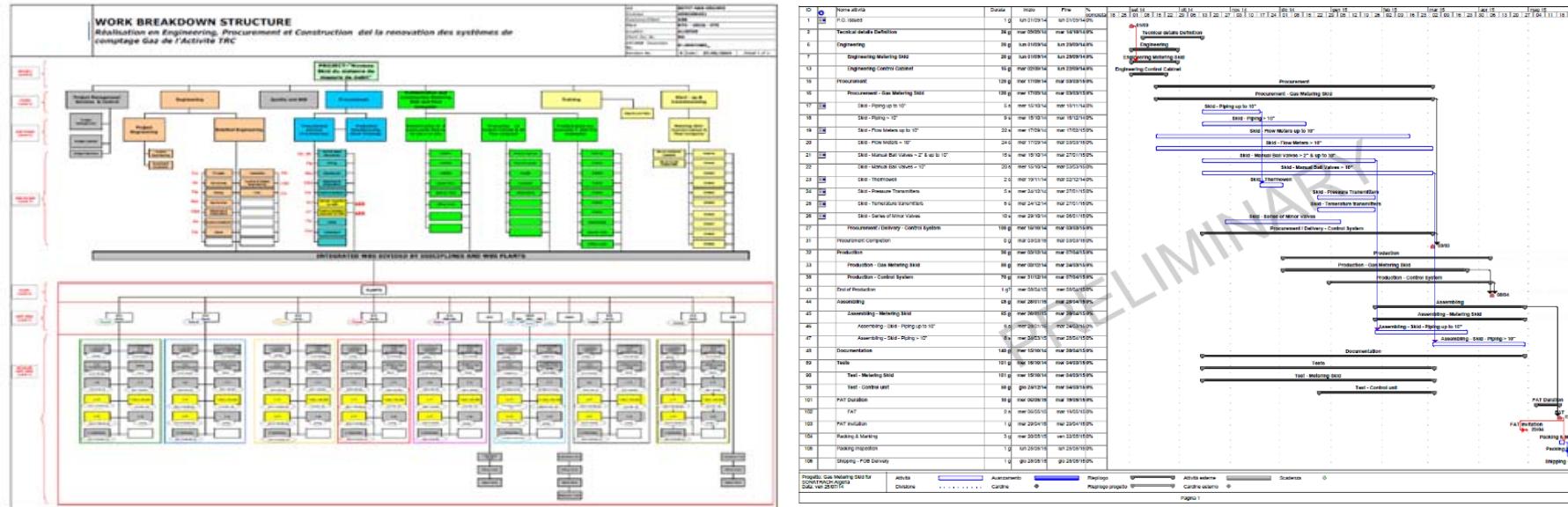
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Project Team: members, structure, organization, competence, rules, responsibility



Project Management &
Team work selection

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Teamwork _Work package
and Planning

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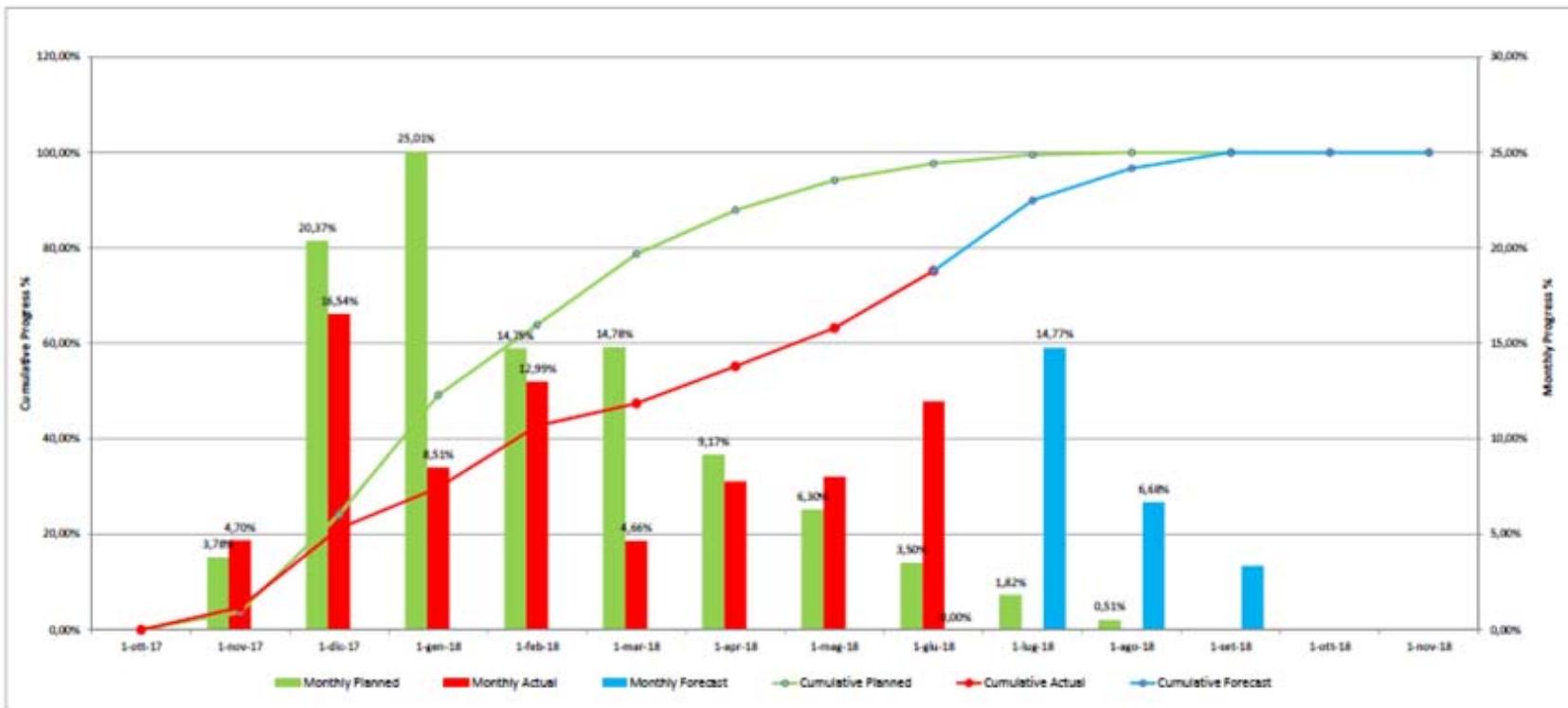
Team work_Workload



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Team work_Progress Control

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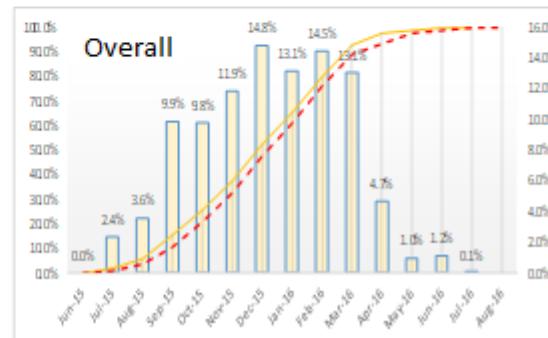
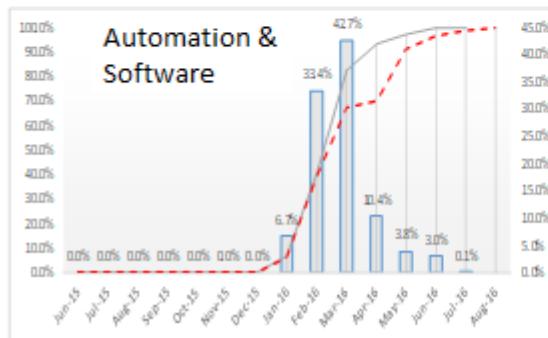
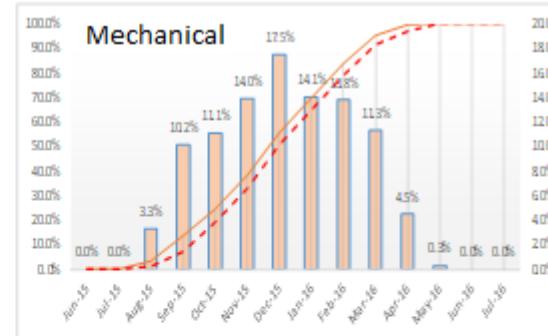
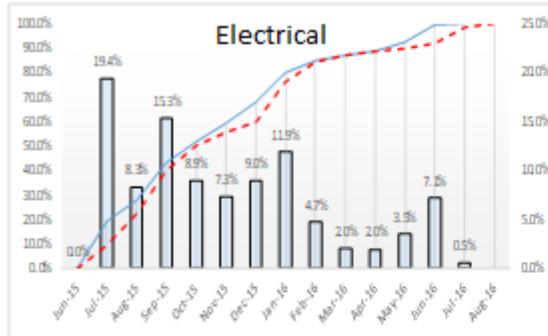
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Team work_progress Control

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Preliminary Analysis:

- Risks
- Opportunities
- Objectives

PM has in charge this study which is even based on the input of the engineering analysis.
and in the PEP definition share the related information with the project team and stakeholders;
Of course even the engineering should be informed of the risks, opportunities and goals of the project.



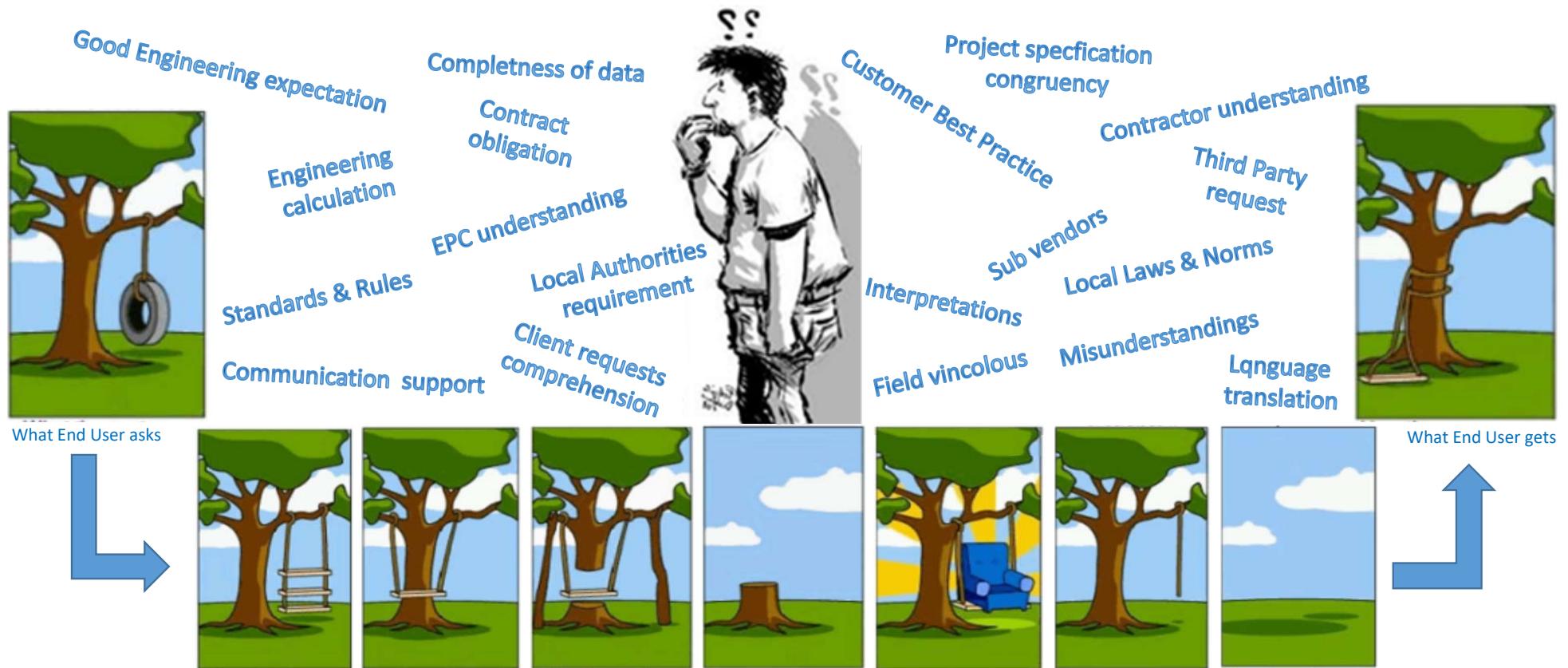
Goals, Risks & Opportunities



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What is the battery limit?

Engineering point of view requires the deep reading of all technical project specifications (process, mechanical, automation, ...) in order to:

- identify anything is required or needs to be included and do not forget anything is due
- guarantee the compliance with the project requirements
- put in evidence any “critical” issue or requirements to be engineered
- find evidence of all existing or potential limits, requirement and incongruencies in norms, laws and Standards applied
- highlight any potential deviations
- distinguish what is clearly not contractually due



Scope of Work

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What is the battery limit?

Project specification analysis from the Engineering is fundamental to PM to define the complete scope of work both in terms of technical and Contractual Term & Conditions

PM will use the results of the Engineering analysis to evaluate any potential impact based on what is contractually agreed, expected from EPC, from Client, necessary to perform.....in order to define with the contractor the effective scope of supply without any misunderstanding.



Scope of Work

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Analysis vincolous:

- Process data
- Ambient condition
- Space availability
- Utilities provided
- Mechanical requirement
- Instrument capability
- Performance requirement
- Local laws obligations
- Standards and Rules recommendations
- Customer Best Practice guideline
-



Vincolous

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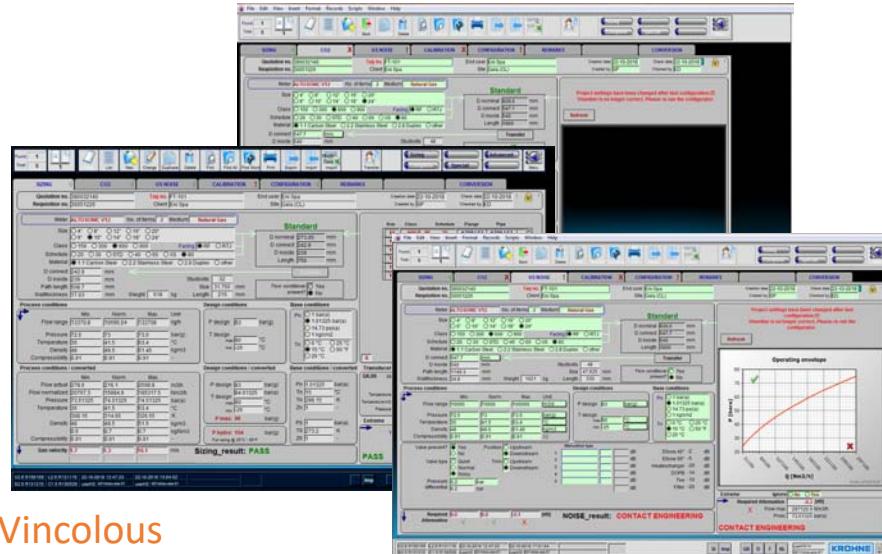
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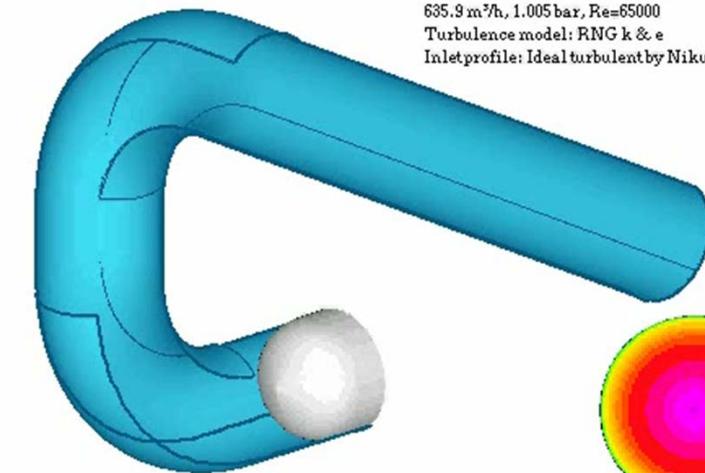
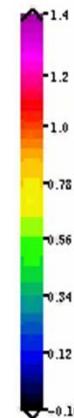
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Analysis vincolous:

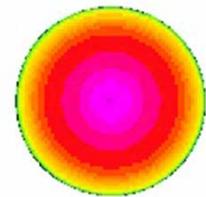
- Instrument capability



Vincolous



Crossflow velocity



Axial velocity

ruhrgas

double bend outofplane
D=200 mm, radius of curvature=1.5 D
635.9 m³/h, 1.005 bar, Re=65000
Turbulence model: RNG k & e
Inletprofile: Ideal turbulent by Nikuradse

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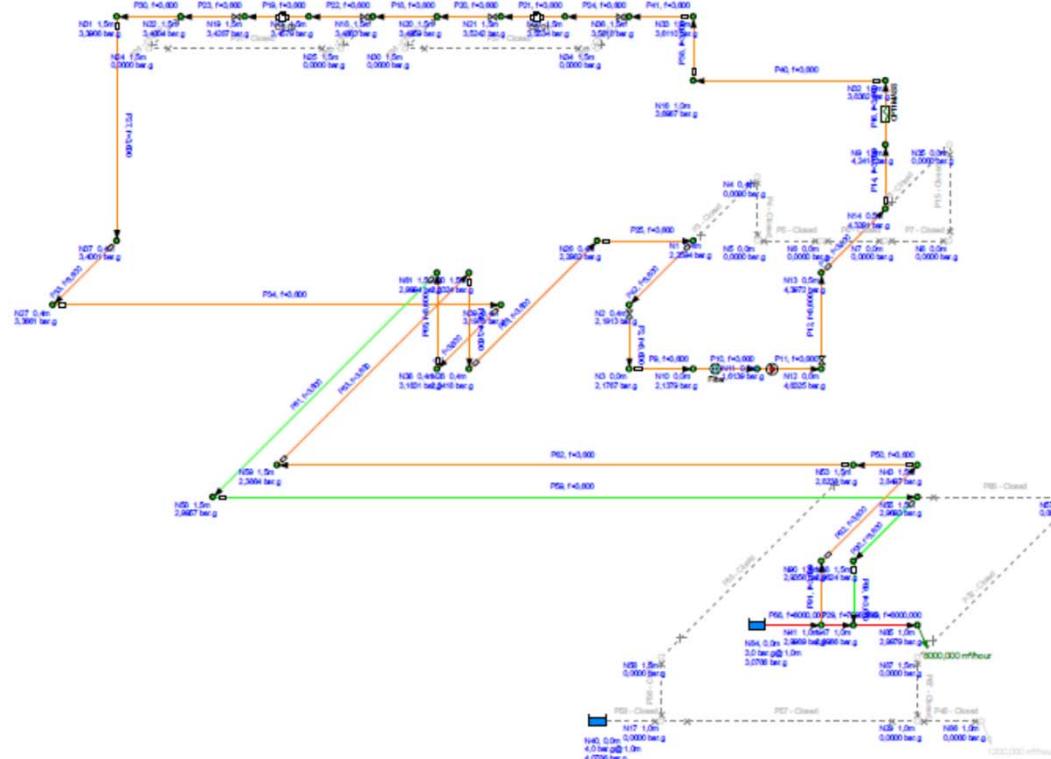
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Analysis vincolous:

- Pressure Loss



Vincolous



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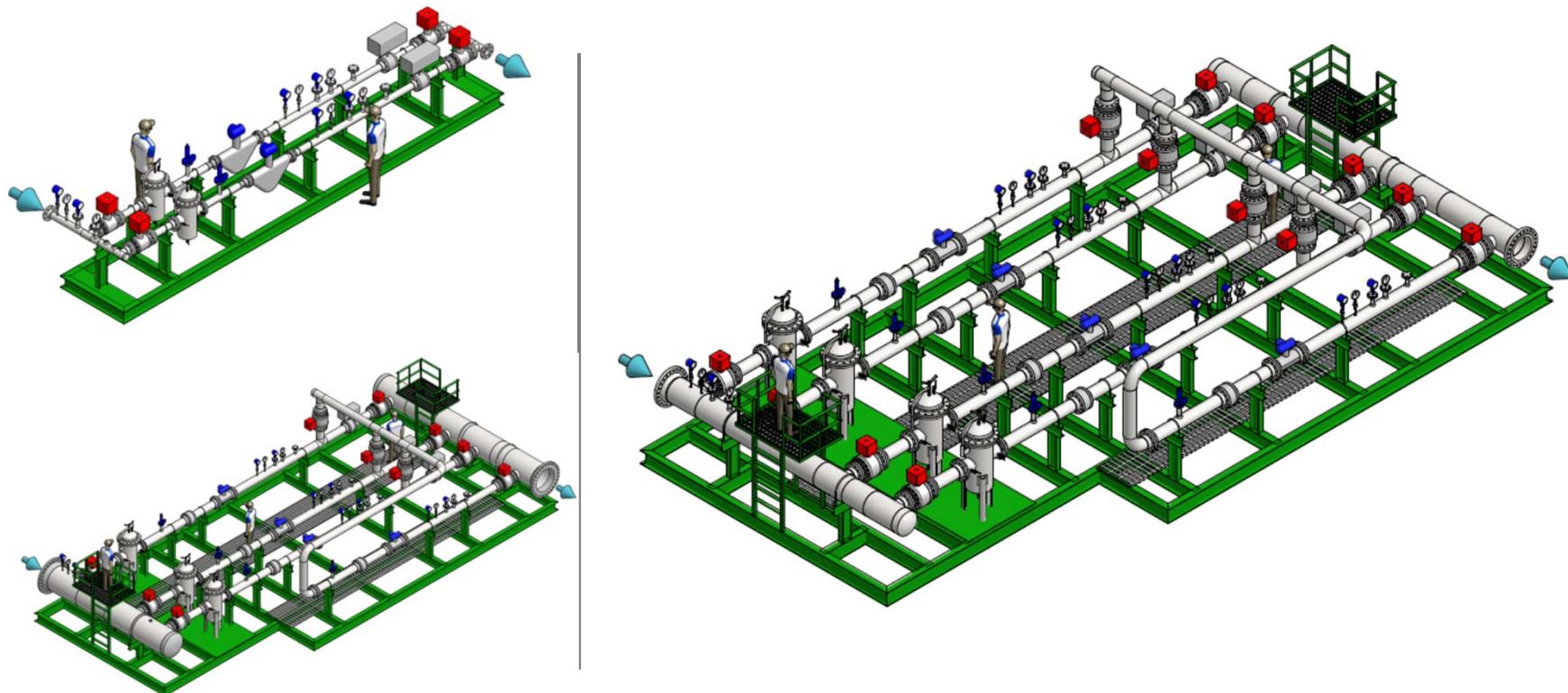


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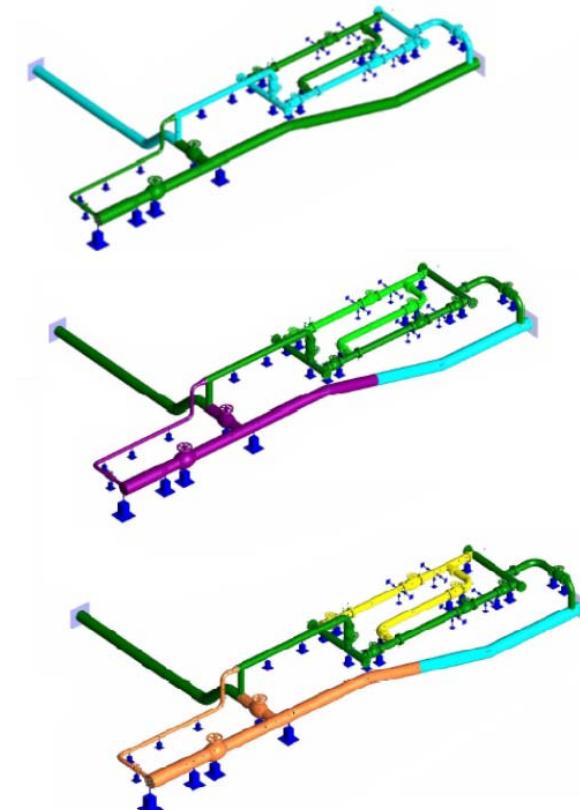
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Analysis vincolous:

- Wind and heartquake
- Stress Analysis



Vincolous



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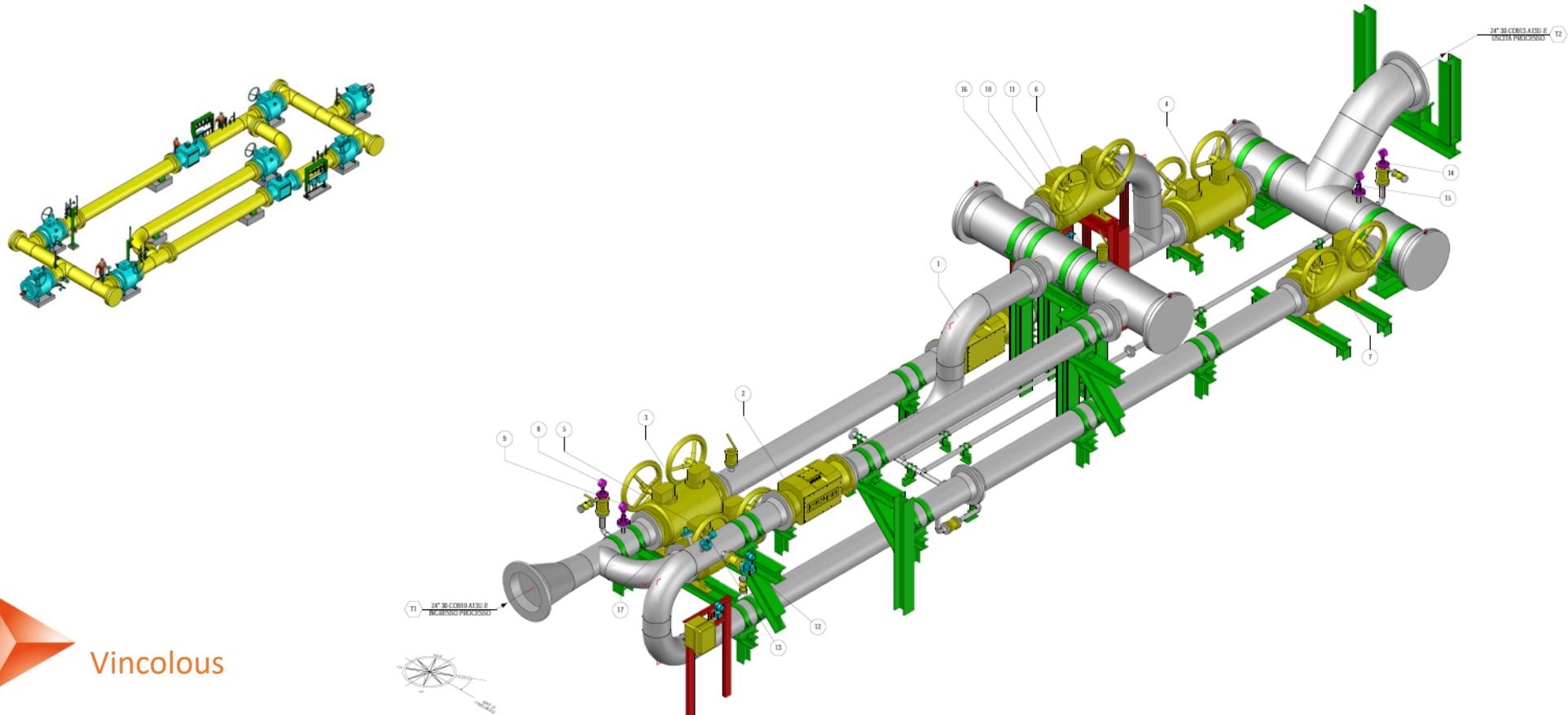
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Vincolous

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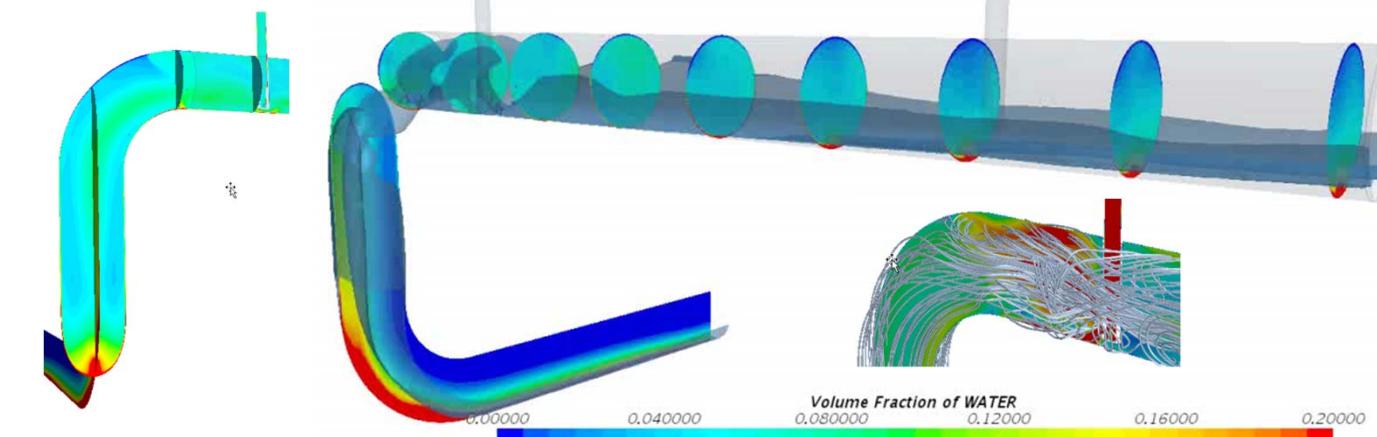
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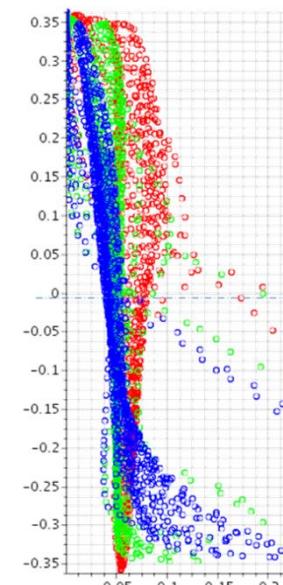
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- Analysis vincolous
 - Mixing verification with CFD simulation



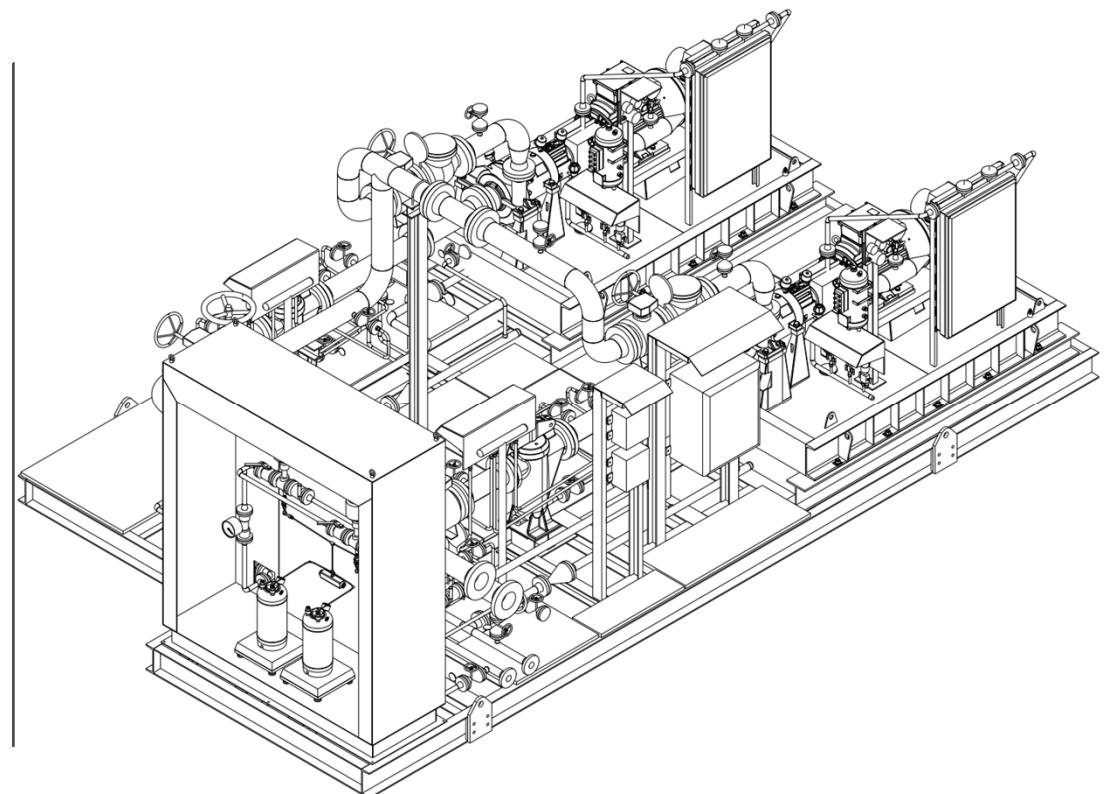
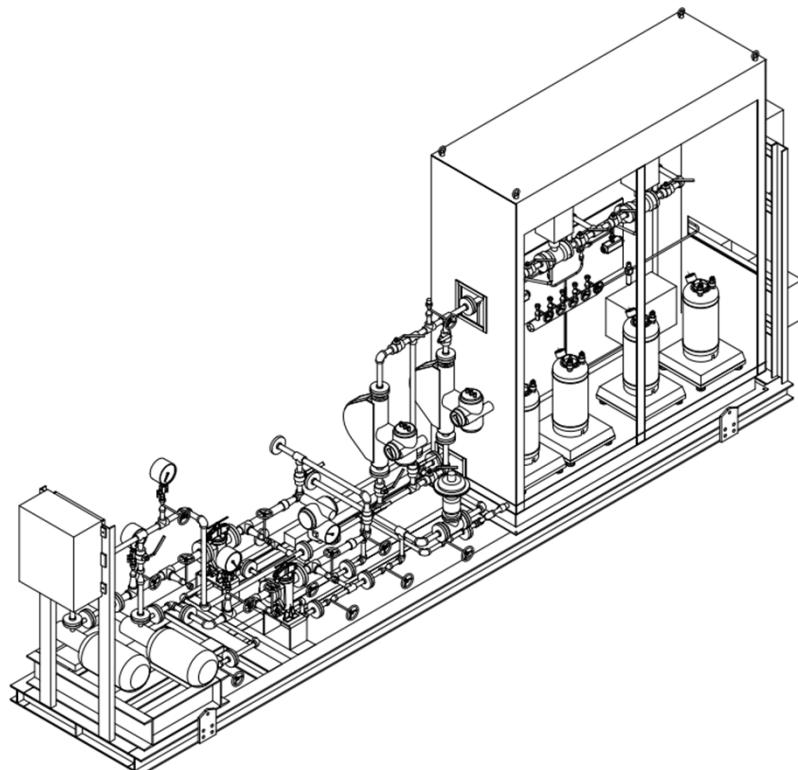
Vincolous



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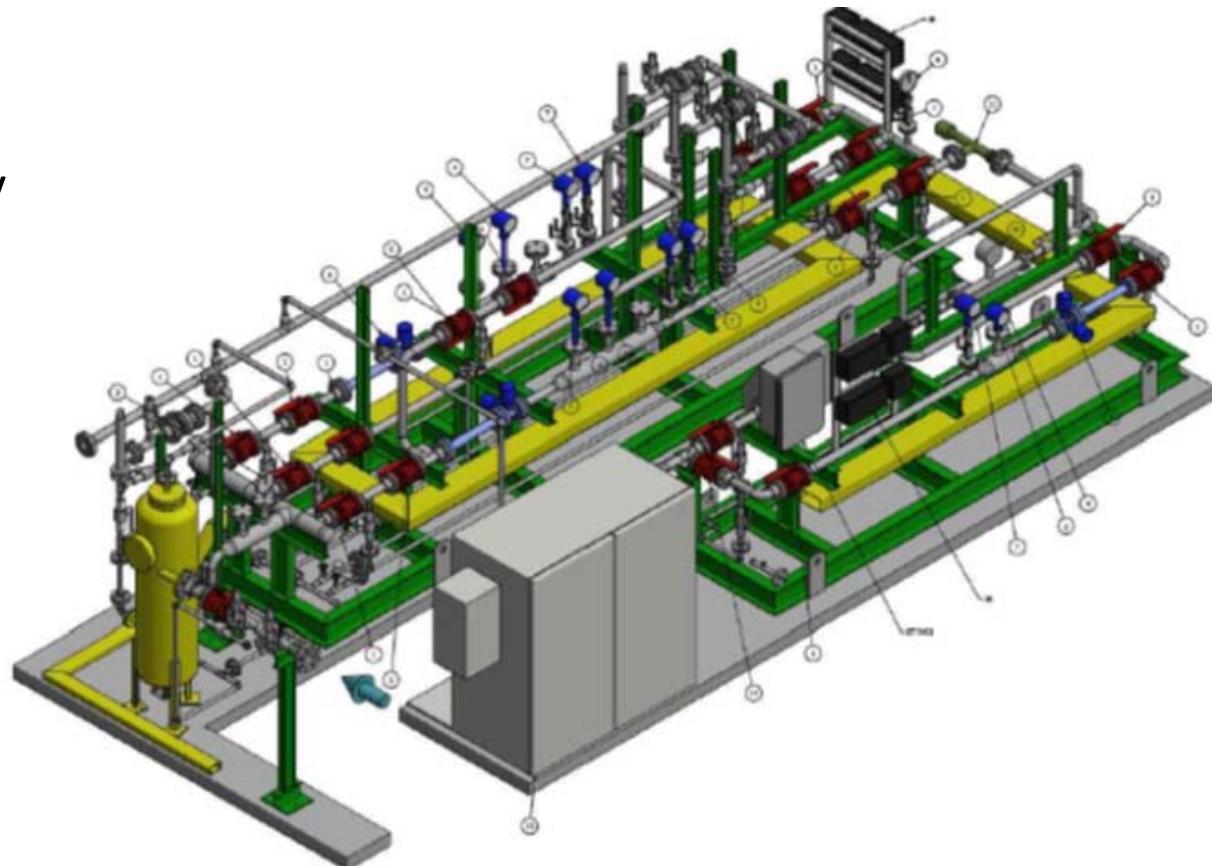


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- Analysis vincolous
 - Space availability



Vincolous

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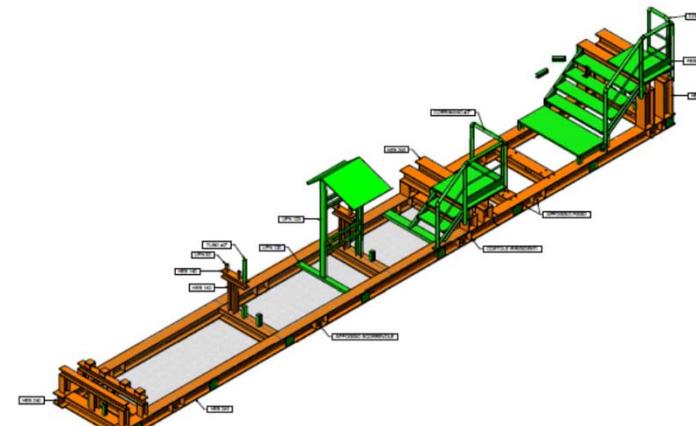
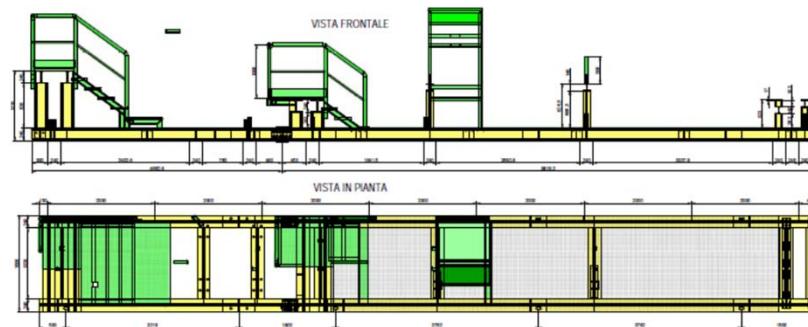


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- Analysis vincolous
 - Accessibiity



Vincolous

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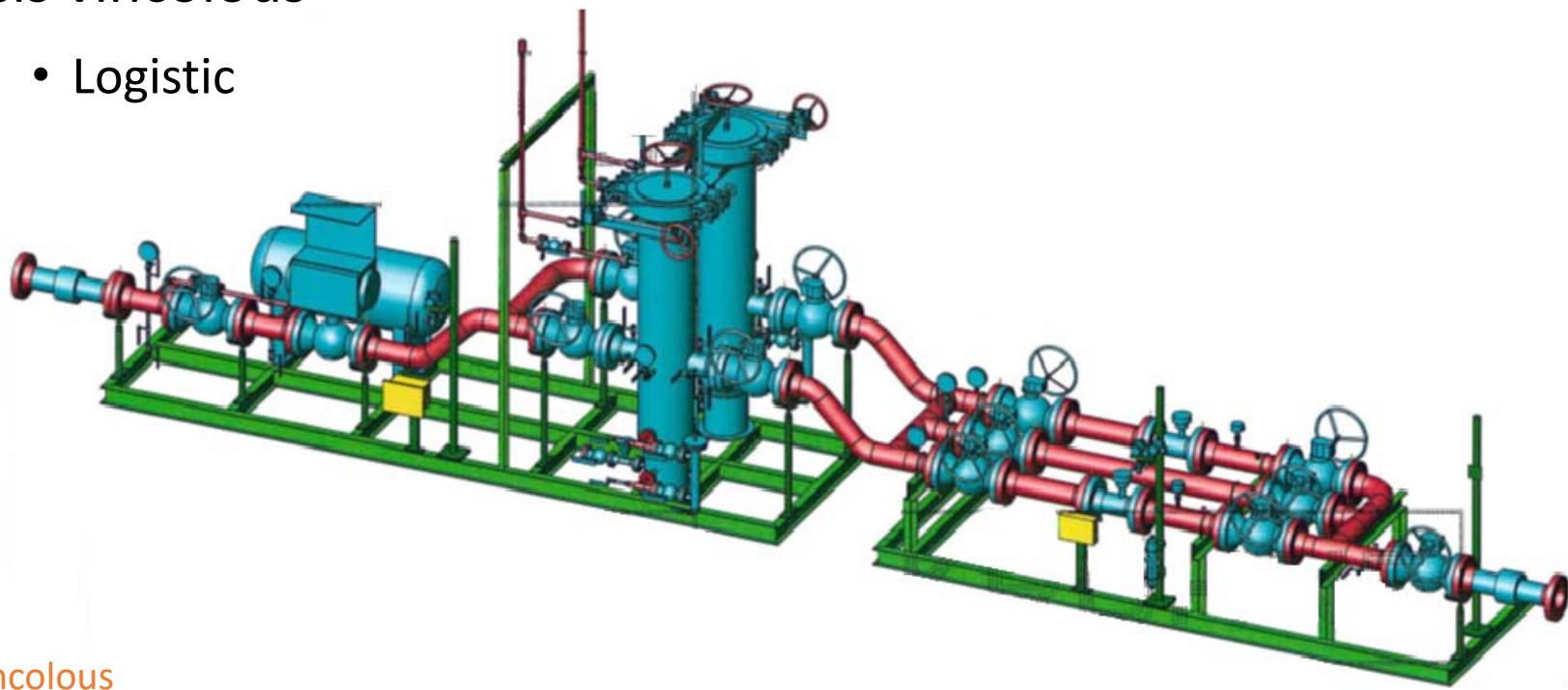


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- Analysis vincolous
 - Logistic



Vincolous

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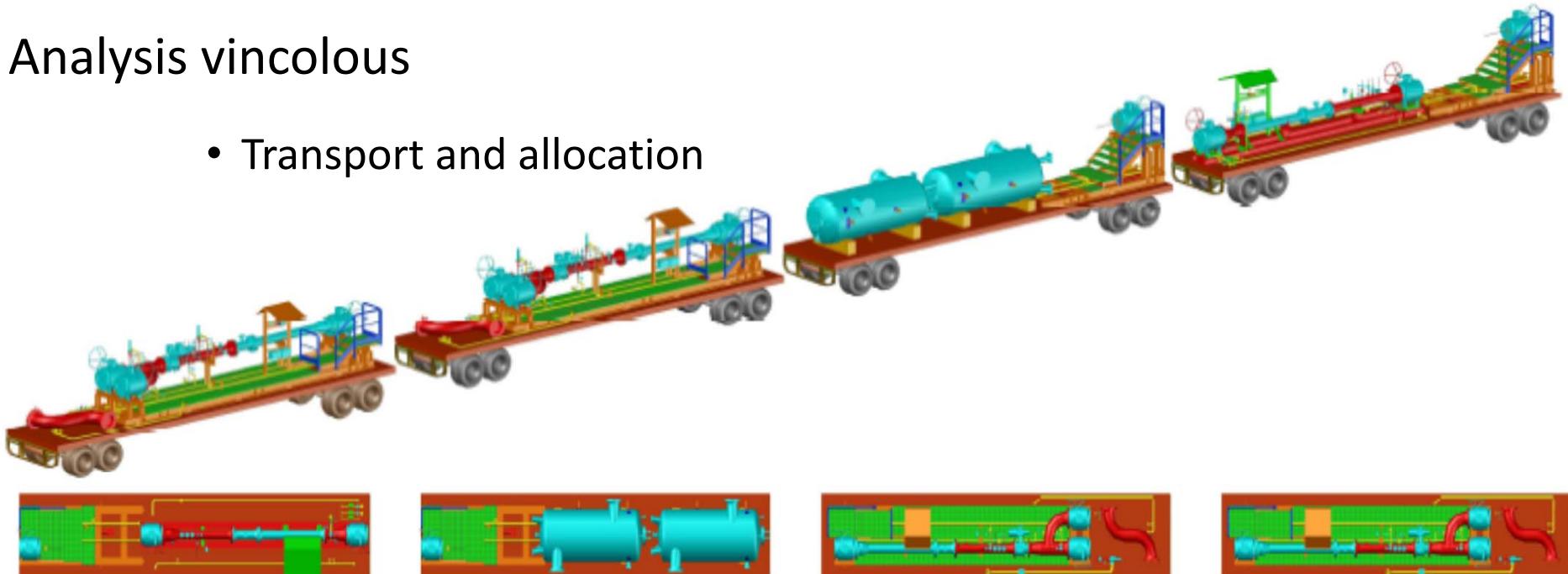


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- Analysis vincolous
 - Transport and allocation



Vincolous

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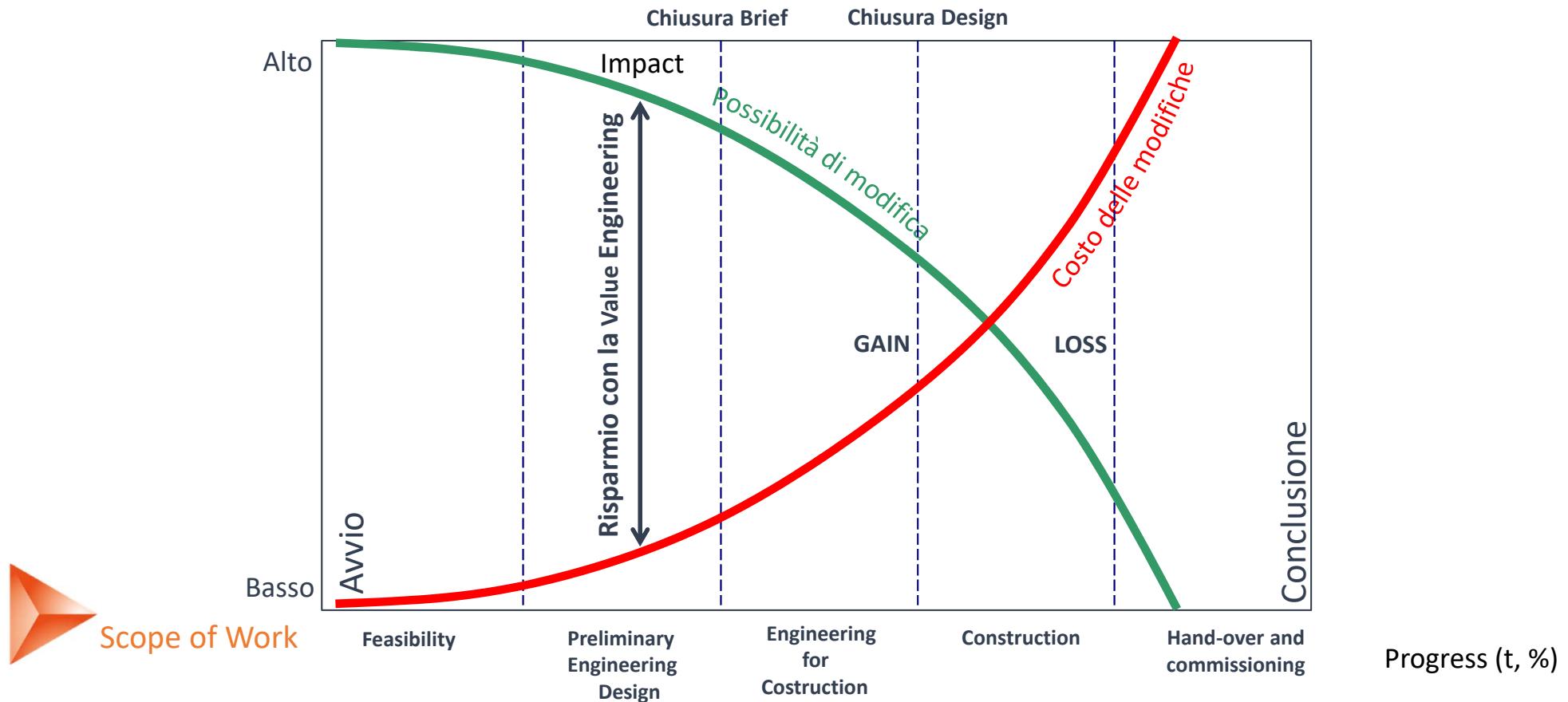
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Evidence of the work performed:

- Quality Plan
- Performance

Engineering shall provide documents, calculation report and /or integrate solution which could be needed to support and verify the quality and the performance agreed



Acceptance Criteria



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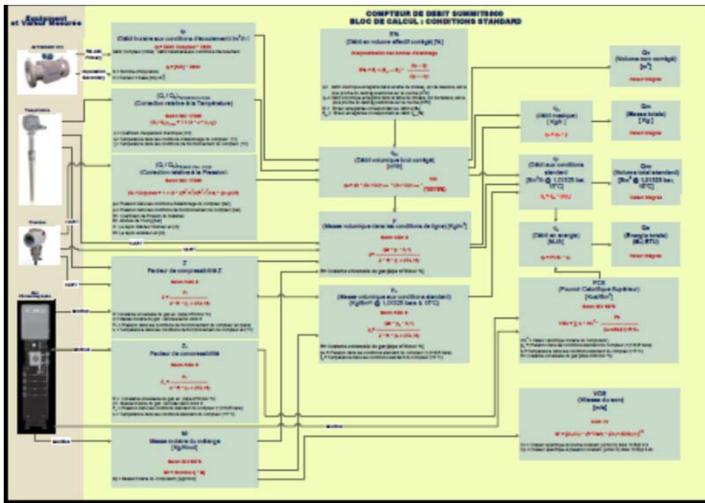


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Evidence with documents:



Acceptance Criteria

Uncertainty Module 201

Block: Input/Output:
Module: TEMPLATE

Inputs

Select data input option:

- Fixed operating conditions, flowrate range
- Production profile
- Single meter run
- Multiple parallel meters runs

Flow range input (single meter)

Operating conditions

P	1 40 50	bar bar g bar g	Ambient pressure Line pressure Temperature
---	---------------	-----------------------	--

Flowrates

Val (m/s)	Meter factor
0.9	1,000
3.2	1,000
5.5	1,000
7.7	1,000
10.0	1,000
12.3	1,000
14.6	1,000
16.9	1,000
19.1	1,000
21.4	1,000

Update calculation

Outputs

Single meter uncertainty

Velocity (m/s)	Volume flowrate Q _v (m ³ /s) Uncert. (%)	Mass flowrate Q _m (kg/s) Uncert. (%)	Std volume flowrate Q _v (m ³ /s) Uncert. (%)	Energy flowrate Q _e (Mj/s) Uncert. (%)
0.9	0.024 0.31	0.279 0.45	0.025 0.45	37.6 0.46
3.2	0.985 0.31	1.278 0.45	0.327 0.45	112.0 0.46
5.5	0.146 0.31	0.427 0.45	0.529 0.45	226.3 0.46
7.7	0.207 0.31	0.526 0.45	0.821 0.45	323.6 0.46
10.0	0.269 0.31	0.725 0.45	10.63 0.45	418.9 0.46
12.3	0.330 0.31	10.75 0.45	13.06 0.45	514.2 0.46
14.6	0.391 0.31	12.74 0.45	15.47 0.45	609.5 0.46
16.9	0.505 0.31	16.48 0.45	20.01 0.45	798.5 0.46
19.1	0.513 0.31	18.72 0.45	20.30 0.45	800.2 0.46
21.4	0.574 0.31	18.71 0.45	22.72 0.45	895.5 0.46

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Evidence with dynamic
in house test:



Acceptance Criteria



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Evidence
with test on site
if properly foreseen
by the engineering:



Acceptance Criteria



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Lesson & Learned



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