



Webinar

EA-SAS Cloud Platform

Digital Twin

2021-09-03

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About Energy Advice

Energy Advice is technology and consulting company
focused on **energy intensive** industries

Provide **EA-SAS Cloud Platform** and consulting services
to increase efficiency and sustainability.



EA-SAS



EA-SAS
Ventilation



EA-SAS
Boiler



EA-SAS
Heating



EA-SAS
Cooling



EA-PSM
Hydraulic



EA-PSM
Electric

EA-SAS Cloud Platform

Smart meter integration:

- Heat energy meter;
- Electricity meter;
- Water meter;
- Gas meter;

- Any protocol;
- Any device type;

Map visualization:

- Real time data update;

The screenshot displays the EA-SAS Cloud Platform interface. The browser address bar shows the URL: `easas.energyadvice.lt/EASAS/views/gis/mapview.xhtml`. The interface includes a sidebar menu with sections: MAIN (Index, User management, Server, Airflow tasks), DASHBOARDS (Dashboard management), SITUATION (Situmos tinklas, BK-1, Biokuras), TASKER (Orders, Schedule, Timeline, Reports), CRM (Companies, Contacts, Deals / Projects, Pipeline, Mailing), and DATASERVICES (Product/Items, Measurement, Map, Data, Reports, Schemes, Export). The main area shows a map of Jonava with numerous blue location pins. A pop-up window titled "Device latest measurements" for "Chemikų g. 134" displays the following data:

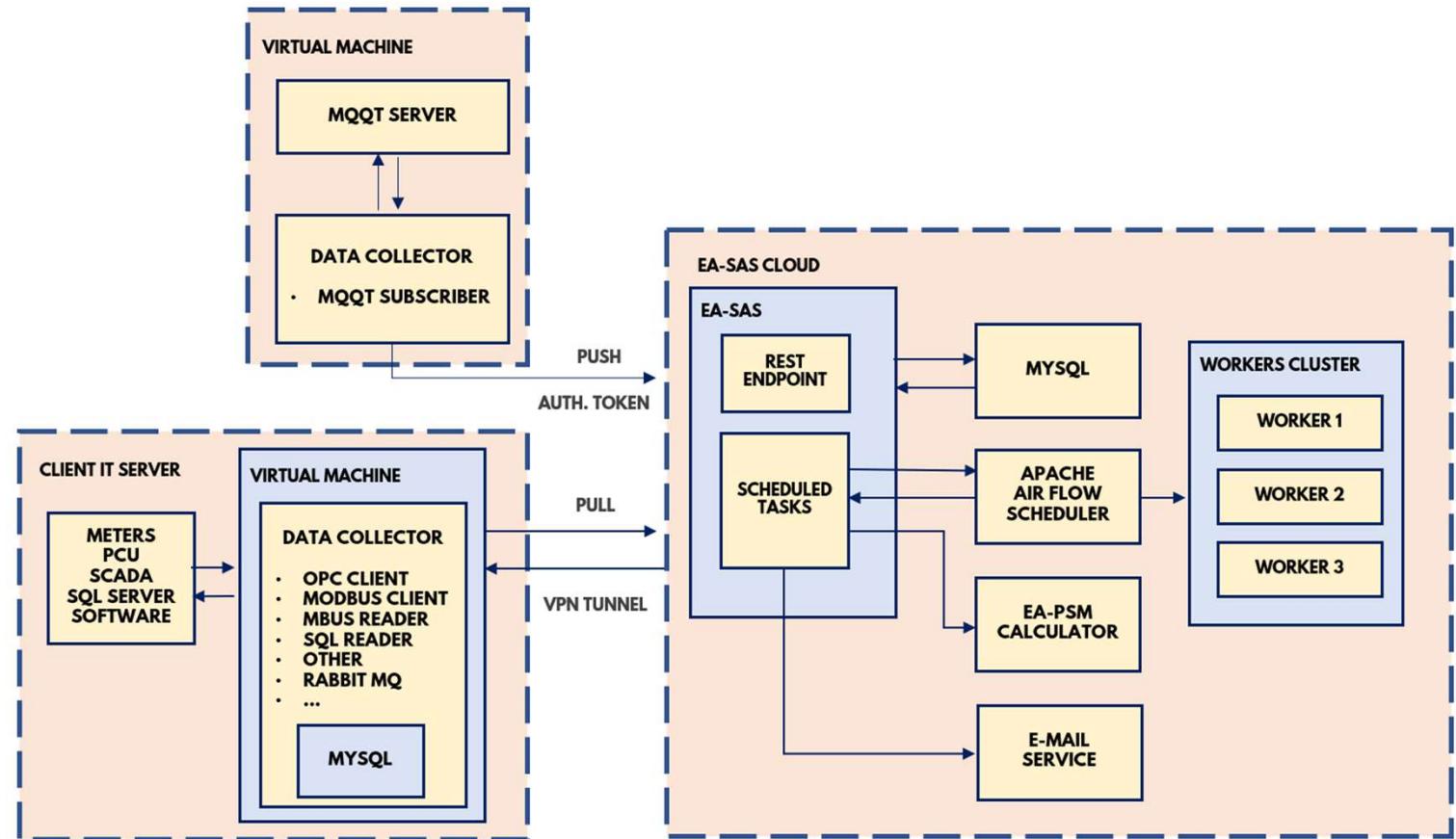
Measurement	Value
Chemikų g. 134 Return temperature (heating contour)	192.0 °C
Chemikų g. 134 Flow	540.0 l/h
Chemikų g. 134 Flow temperature	58.6 °C
Chemikų g. 134 Return temperature (hot water contour)	192.0 °C
Chemikų g. 134 Power	6.1 kW
Chemikų g. 134 Hot water temperature	53.3 °C
Chemikų g. 134 Return temperature	48.7 °C
Chemikų g. 134 Heating system fluid temperature	192.0 °C
Chemikų g. 134 Ambient temperature	192.0 °C
Chemikų g. 134 Accumulated energy	154406 kWh
Chemikų g. 134 Room temperature	19.2 °C
Chemikų g. 134 Room temperature	19.2 °C
Chemikų g. 134 Accumulated volume	5357 m3
Chemikų g. 134 Accumulated volume	4904 m3
Chemikų g. 134 - Connection status	1.0

UAB Energy Advice, 2021

EA-SAS Cloud Platform

Scada data collection:

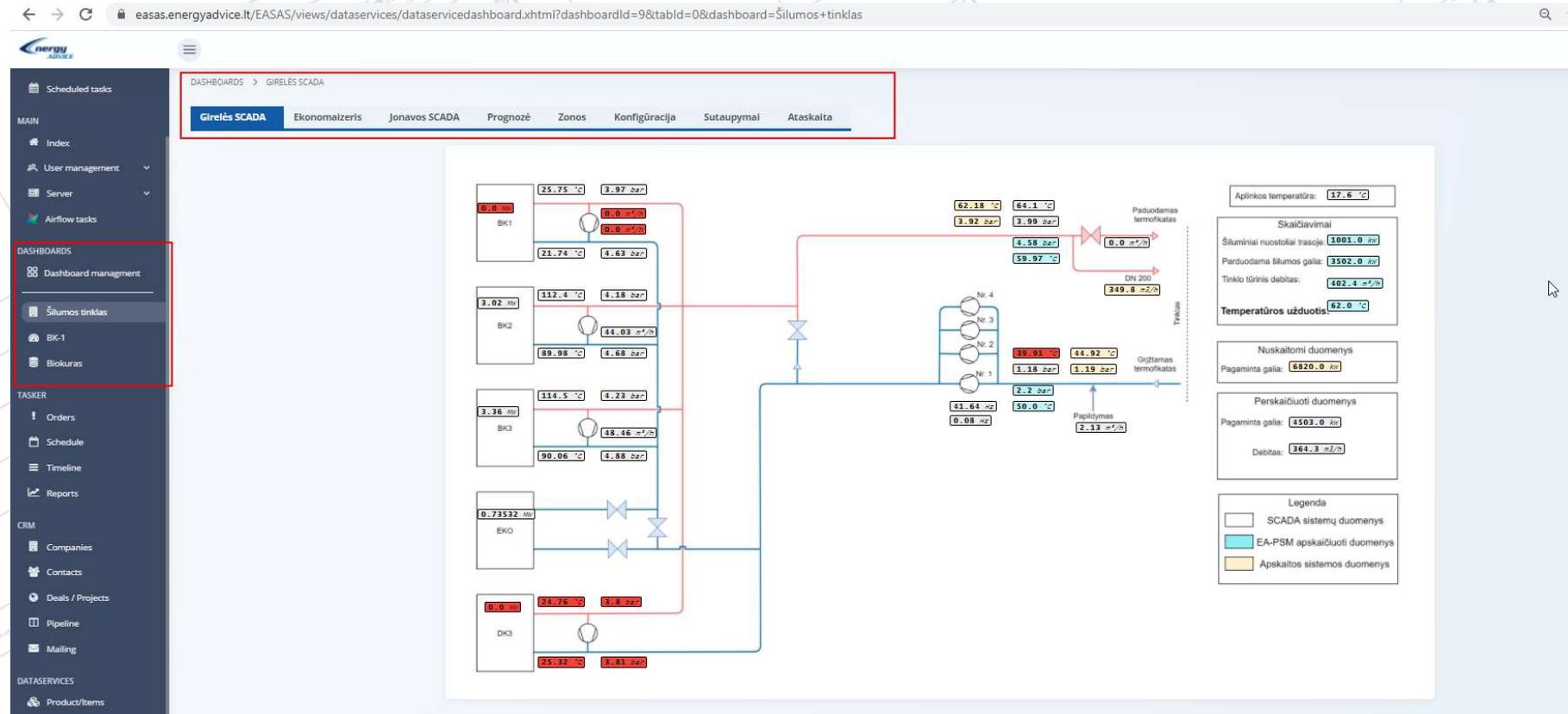
- S7;
- H1;
- Modbus;
- Profinet, profibus;
- OPC;
- Rest API;
- Other...



EA-SAS Cloud Platform

Visualization Dashboards:

- Fully Flexibility for configuration;
- Multiple Tab;
- Language support;
- Dashboard by user group;
- Data real time update;



EA-SAS Cloud Platform

Real time analytics:

- Airflow support;
- Python inside;
- Calculation schedule;
- Parallel calculation;
- Cascade, dependent calculation;

airflowDagList.html

MAIN > SERVER > AIRFLOW DAGS

Airflow DAGs

+ Create DAG Refresh cache

Airflow ID	Title	Company	Descript
BK1_state_estimator	BK1 state estimator	Jonavos šilumos tinklai	
calculate_control_error	Calculates process control error	Jonavos šilumos tinklai	
control_set_points	Calculate control setpoints	Jonavos šilumos tinklai	
daily_aggregation	Daily aggregation		
heat_consumption_prediction	Predict heat consumption		
hourly_aggregation	Hourly aggregation		
losses_calculations	Losses calculations		
monthly_aggregation	Monthly aggregation		
monthly_heating_model_updates	Monthly model update		
process_measurements	Process measurements		
production_planning	Production planning		
report_calculations	Report aggregation and calculati		

Airflow DAGS Browse Docs

DAG Import Errors (1)

DAG: BK1_state_estimator

Tree View Graph View Calendar View Task Duration Task Tries

2021-09-03T10:06:19Z Runs 25 Update

DummyOperator EAPythonTaskOperator

[DAG] state_estimator aggregate_hourly finish_sync_task dumu_trakto_hidrauliniai_coef finish_sync_task

Sep 02, 04:05 Sep 02, 04:30 Sep 02, 04:55 Sep 02, 05:20 Sep 02, 05:45 Sep 03, 13:06

DAGS

All 12 Active 12 Paused 0

Filter DAGs by tag Search DAGs

DAG	Owner	Runs	Schedule	Last Run	Recent Tasks
BK1_state_estimator Jonavos šilumos tinklai	jonavos_silumos_tinklai	1000	05:****	2021-09-03, 10:06:19	1 2 3 4 5 6 7 8 9 10 11 12
calculate_control_error Jonavos šilumos tinklai	jonavos_silumos_tinklai	1000	15:****	2021-09-03, 08:15:00	1 2 3 4 5 6 7 8 9 10 11 12
control_set_points Jonavos šilumos tinklai	jonavos_silumos_tinklai	1000	*15:****	2021-09-03, 10:00:00	1 2 3 4 5 6 7 8 9 10 11 12
daily_aggregation Jonavos šilumos tinklai	jonavos_silumos_tinklai	1000	*20:****	2021-09-03, 09:40:00	1 2 3 4 5 6 7 8 9 10 11 12
heat_consumption_prediction Jonavos šilumos tinklai	jonavos_silumos_tinklai	1000	25:****	2021-09-03, 09:30:48	1 2 3 4 5 6 7 8 9 10 11 12
hourly_aggregation Jonavos šilumos tinklai	jonavos_silumos_tinklai	1000	*15:****	2021-09-03, 10:00:00	1 2 3 4 5 6 7 8 9 10 11 12
losses_calculations Jonavos šilumos tinklai	jonavos_silumos_tinklai	1000	33:****	2021-09-03, 08:33:00	1 2 3 4 5 6 7 8 9 10 11 12
monthly_aggregation Jonavos šilumos tinklai	jonavos_silumos_tinklai	1000	30:3****	2021-09-02, 03:30:00	1 2 3 4 5 6 7 8 9 10 11 12
monthly_heating_model_updates Jonavos šilumos tinklai	jonavos_silumos_tinklai	1000	30:31****	2021-08-01, 03:30:00	1 2 3 4 5 6 7 8 9 10 11 12
process_measurements Jonavos šilumos tinklai	jonavos_silumos_tinklai	1000	*15:****	2021-09-03, 10:00:00	1 2 3 4 5 6 7 8 9 10 11 12

EA-SAS Cloud Platform

GIS data:

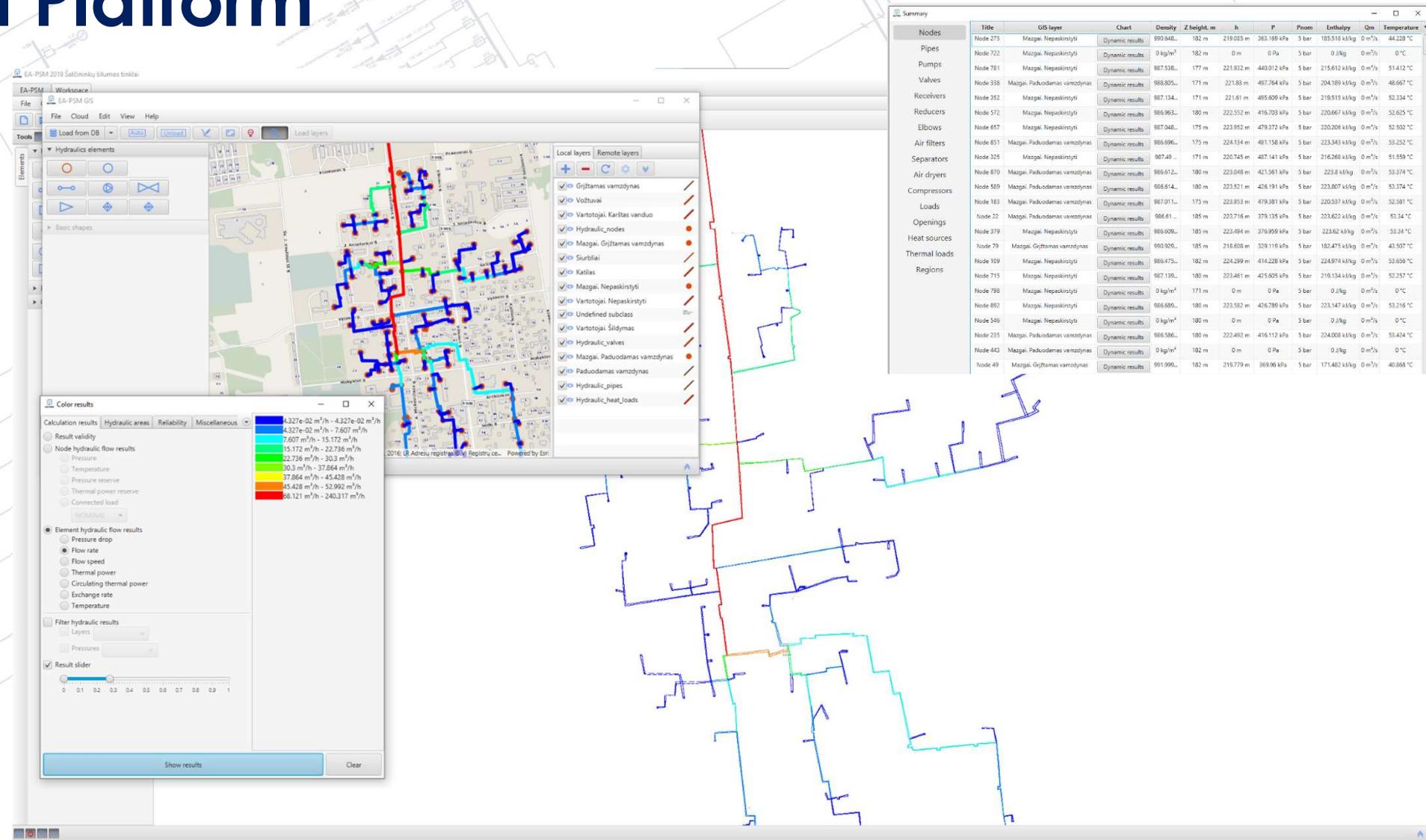
- ESRI GIS engine inside;
- Electric Grid model;
- Gas pipe model;
- Water pipe model;
- Thermal network model;

Electrical calculations

Compressible fluid flow

Uncompressible fluid flow

Thermal – Hydraulic flow



EA-SAS Heating

Digital Twin solution for District Heating:

- GIS data model preparation;
- Consumer Smart energy meter data collection;
- Consumer energy forecast;
- Thermal Hydraulic flow calculation for each operation hours;
- Heat production Scheduling;
- Flow Temperature optimization, set point optimization;

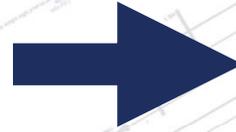


From time: 2021-04-29 08:00 To time: 2021-04-29 16:00

Time	Environmental Temperature	Current Temperature Output	Optimum Temperature Output
2021-04-29 08:00:00	2.8	61.0	61.0
2021-04-29 09:00:00	5.3	61.0	61.0
2021-04-29 10:00:00	7.1	61.1	60.0
2021-04-29 11:00:00	9.1	60.5	60.0
2021-04-29 12:00:00	11.8	60.0	60.0
2021-04-29 13:00:00	12.8	60.0	60.0
2021-04-29 14:00:00	13.8	0.0	60.0
2021-04-29 15:00:00	14.0	0.0	61.0
2021-04-29 16:00:00	14.1	0.0	61.0

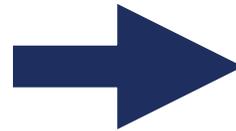
EA-SAS Heating. Case study

Installed Boiler capacity 120MW
Heat supply 140GWh per year



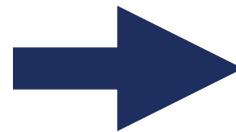
Losses reduction 35%
Heat production reduction 5.6%
7 840 MWh per year

Installed Boiler capacity 51MW
Heat supply 39GWh per year



Losses reduction 35%
Heat production reduction 6.3%
2 457 MWh per year

Installed Boiler capacity 26MW
Heat supply 23GWh per year



Losses reduction 30%
Heat production reduction 4.5%
1 035 MWh per year

EA-SAS Boiler. Projects

- **Biofuel boiler monitoring and real time control optimisation**

Issue:

Biofuel boiler steam consumption unstable;

Biofuel quality, calorific value, water content is unknown during burning process;

Life time increase;

Solution:

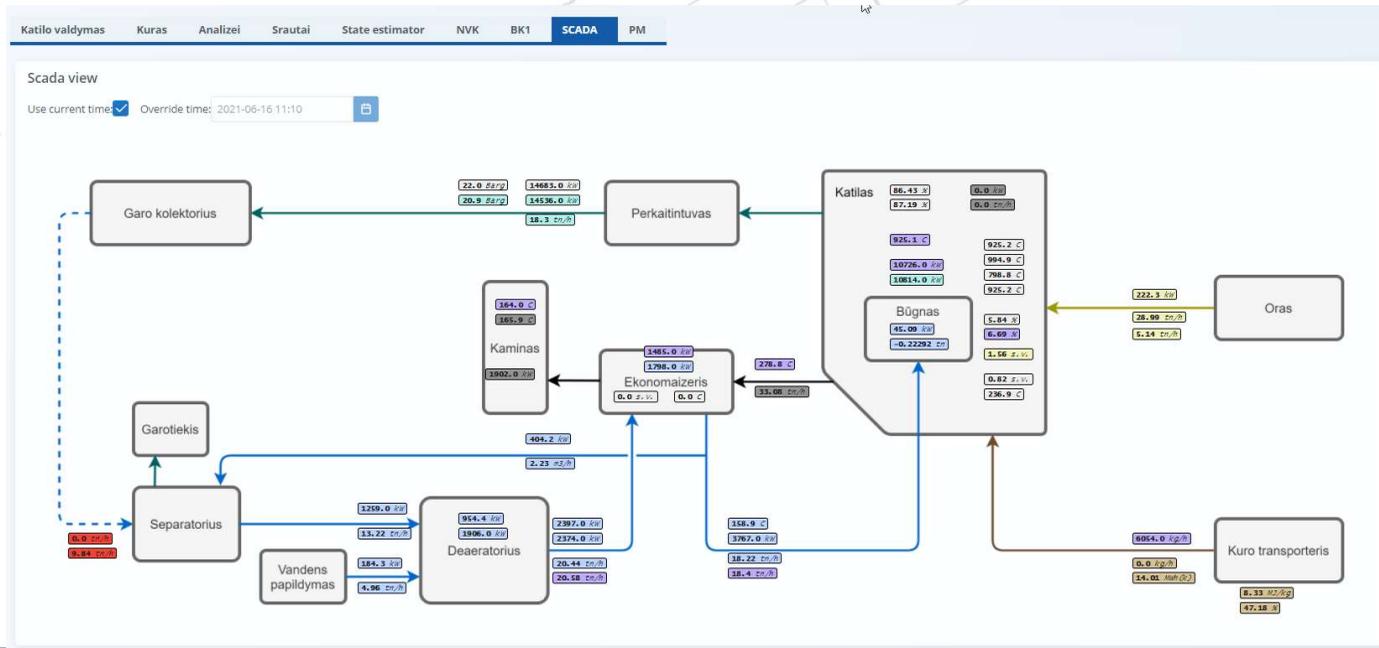
Digital Twin of biomass boiler was produced in **EA-SAS Cloud** platform;

Data from smart meters and Scada are collected each minute;

Boiler efficiency, fuel calorific value are calculated each minute;

Erosion effect limited;

Setpoints for optimum operation provided.



EA-SAS Boiler. Projects

30MW Steam boiler

5MW Condensing Economizer

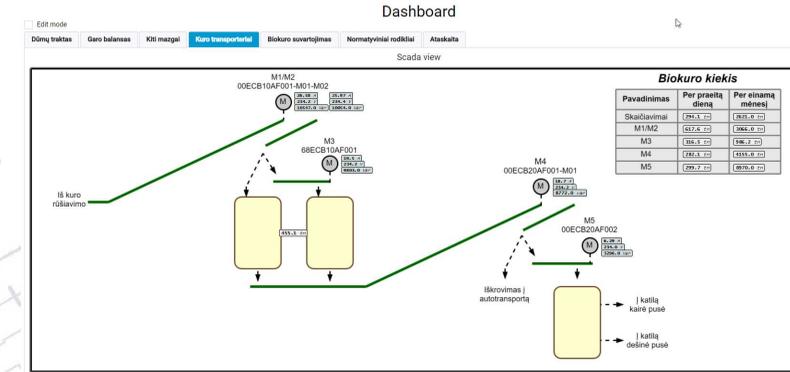
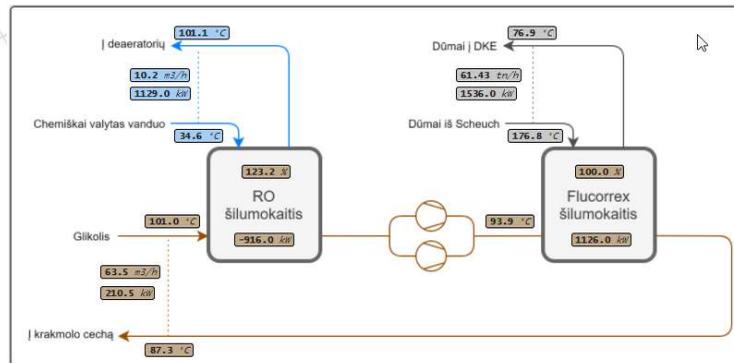
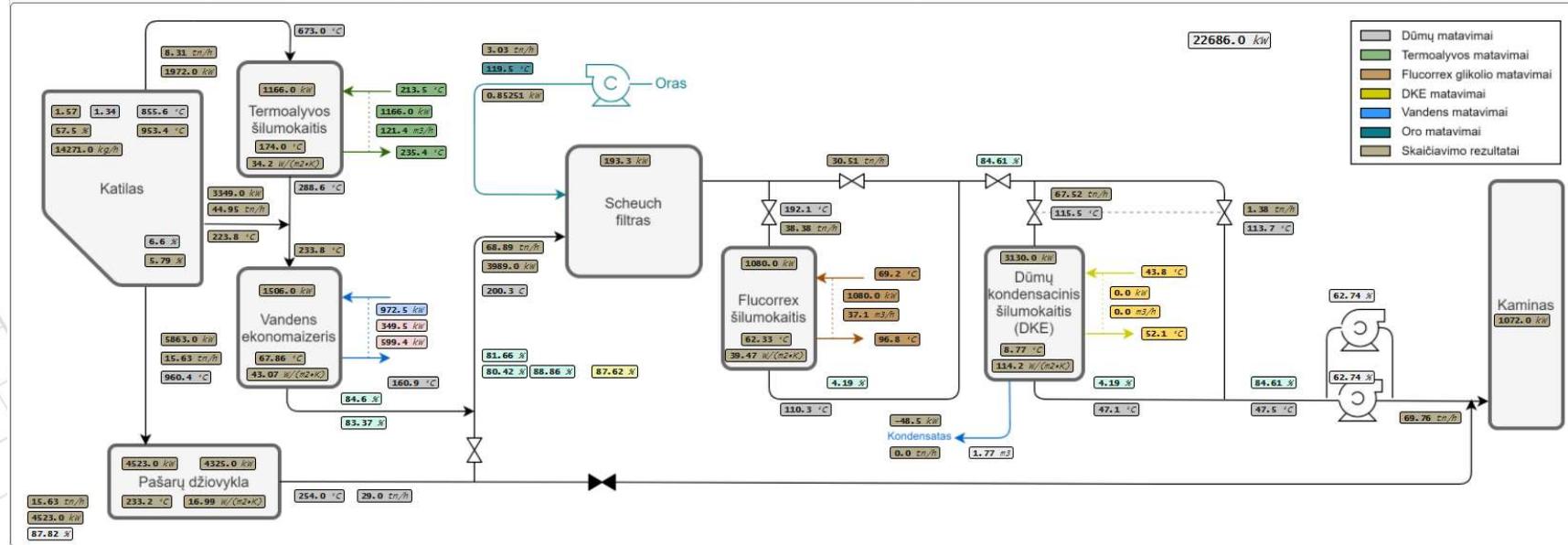
2.5MW Thermal Oil

6MW Flue gas consumer

Fuel: Wood Chip

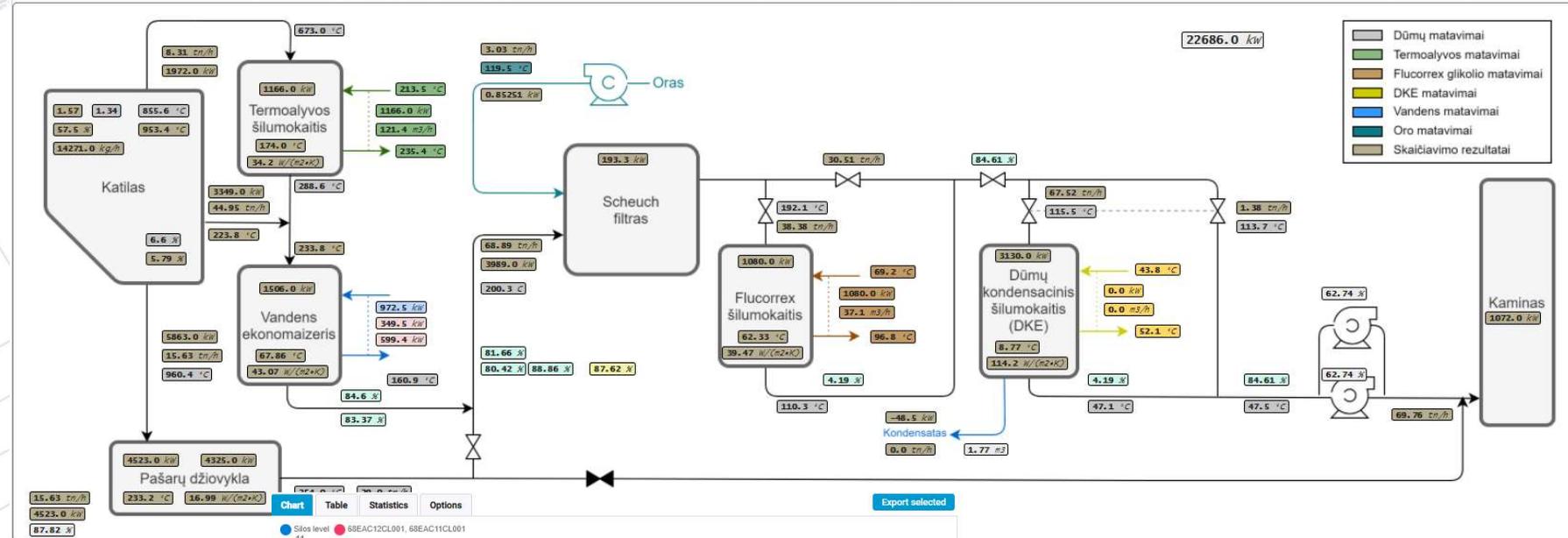
Data: Scada data collection with EA-Data Collector

Project Target: Minute range Fuel consumption monitor, efficiency monitor



EA-SAS Boiler. Projects

- 30MW Steam boiler
- 5MW Condensing Economizer
- 2.5MW Thermal Oil
- 6MW Flue gas consumer



Output: Flue gas flow metering;

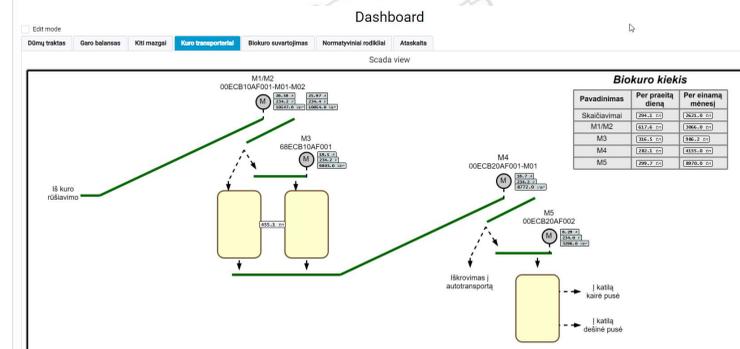
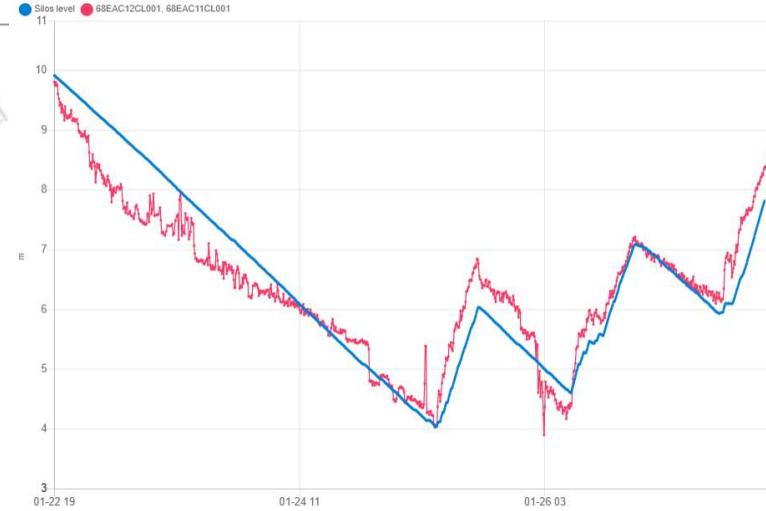
Burning process fluctuation identified;

Air flow meter correction;

Efficiency calculated;

Fuel consumption calculated;

Silo level evaluated.



EA-SAS Cloud platform for **Digital Twin**. Case Study

- Measure parameters indirectly

Issue:

There is no Flue gas heat consumption meter;

Flue gas flow meter do not monitor flue gas flow dynamic;

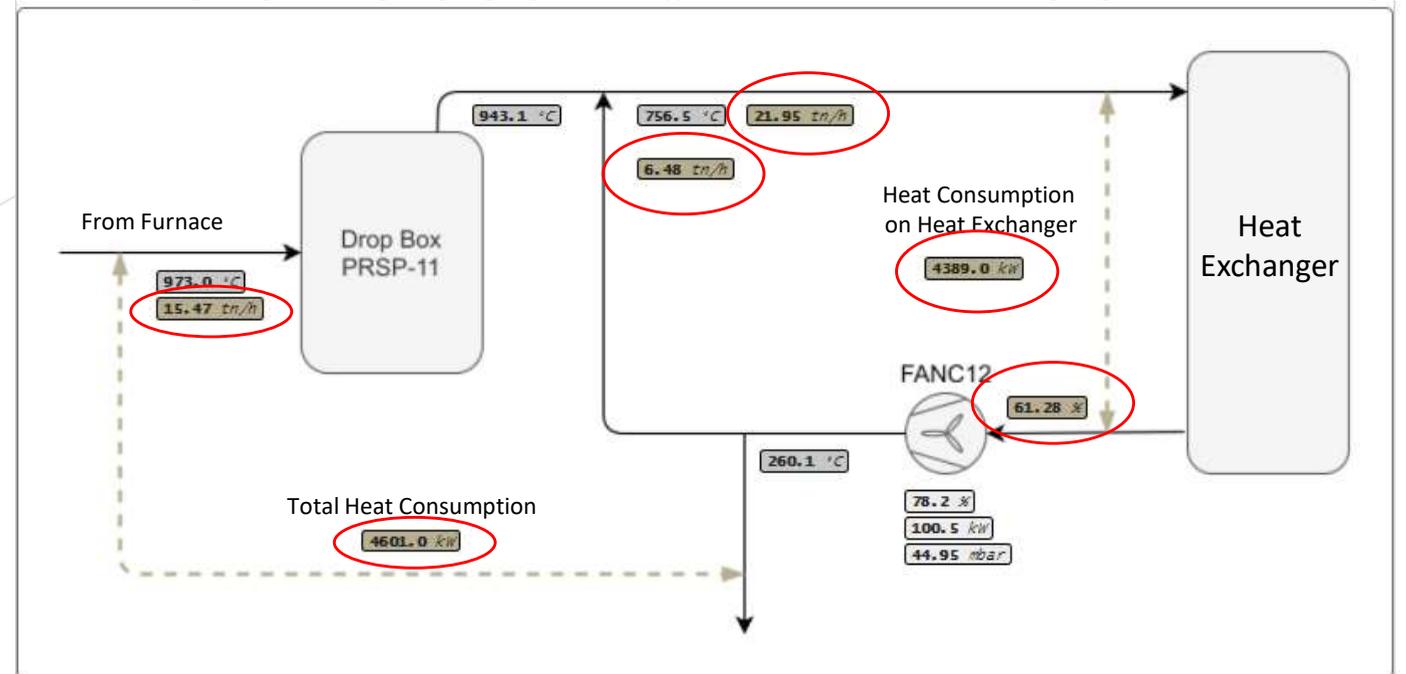
Solution:

VFD frequency, Electric power, Fun characteristic, pressure difference before and after fun available;

From Fun VFD measurement, Flue gas flow on fun evaluated;

Heat consumption calculated.

No additional flow meter is required!



Calculations each 5 minutes;

EA-SAS Cloud calculated value

EA-SAS Cloud platform for **Digital Twin**. Case Study

- **Glass Furnace Digital Twin**

Issue:

Oxygen meter in Flue gas is not installed. Air amount for natural gas burning is metered with supply air flow meter;

Oxygen consumption during chemical glass melting reaction is changing. Efficiency and Glass quality variation;

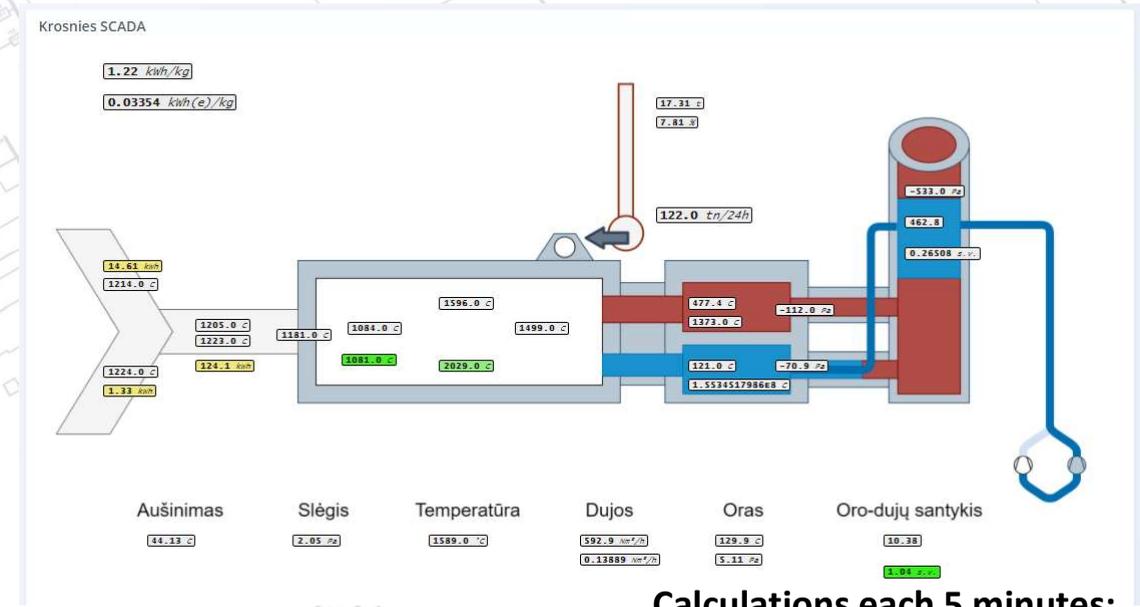
Solution:

Digital Twin for Glass Melting process implemented in EA-SAS Cloud;

Amount of required Air for burning and Glass Melting calculated;

Air supply meter metering error calculated and indicated for maintenance;

Glass melting and Furnace efficiency increased.



Calculations each 5 minutes;



EA-SAS Cloud platform for **Digital Twin**. Case Study

- **Cooling machine Digital Twin**

Issue:

Two stage's cooling machine (+2C, -30C) COP is affected by environmental conditions, cooling demand, condensing and evaporating temperature;

No COP monitoring, ammonia metering;

Solution:

Digital Twin for Cooling machine implemented in EA-SAS Cloud;

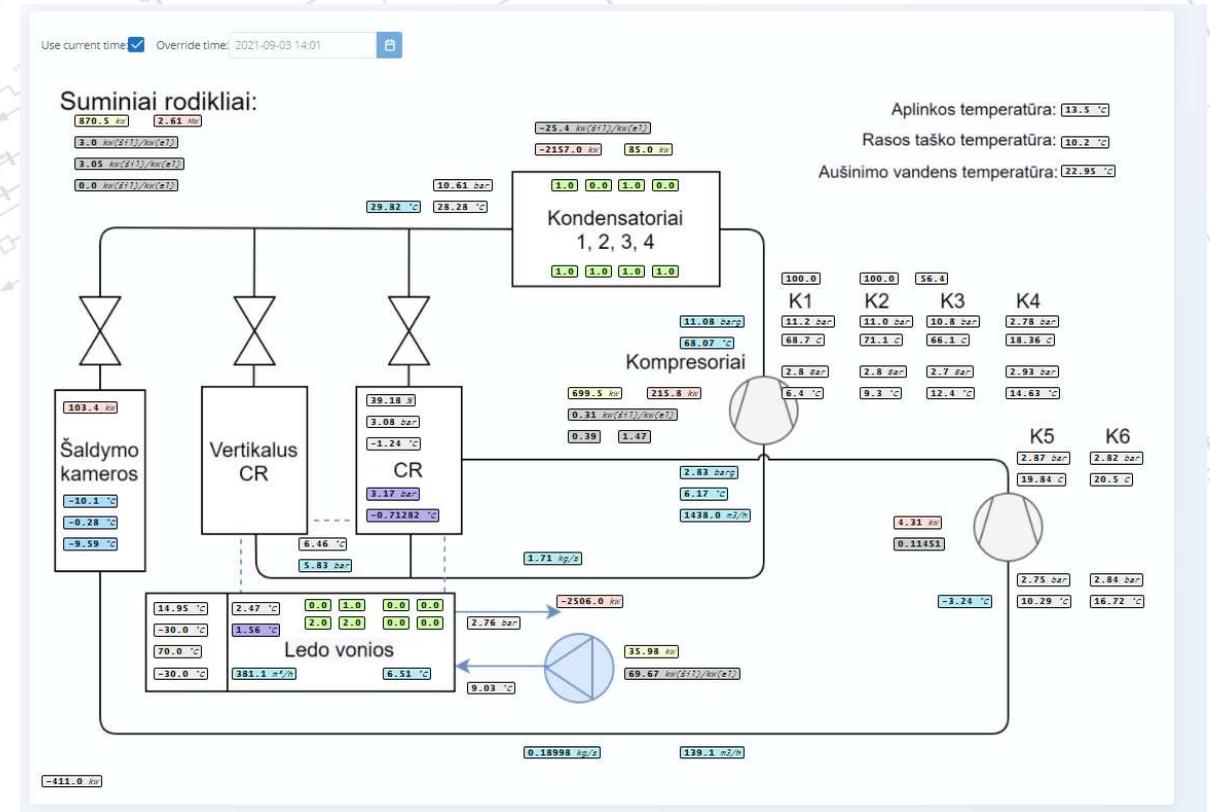
Smart meter data and scada data collected to EA-SAS Cloud;

Amونيا flow calculated;

Real COP of machine calculated;

Status of compressor evaluated;

Optimum setpoints for condensing and evaporating temperature provided.



Calculations each 5 minutes;

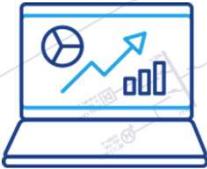
PROCESS

up to 6 months



Energy Advice

- Collecting and monitoring data from existing systems
- Visualize data in EA-SAS Cloud



COLLECT

Energy Advice

- Gathering information about infrastructure and related equipment
- Gathering information about technical processes
- All information saved in EA-SAS Cloud



CONNECT

Energy Advice

- Developing Digital Model (Digital Twin)
- Identifying KPIs
- Preparing optimum operational setpoints



DIGITAL TWIN

Client

- Controlling according to optimum Set Points
- Getting information about status and efficiency
- Getting maintenance forecast



OPERATE



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