Combine Heat and Power (CHP)
Continental Automotive S.R.L

centrica
Business Solutions

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Content

Presentation target:

Provide a short overview of Continental Automotive Trigeneration system implementation and the results

Content:

1. Trigeneration system (CHP) overview
2. Implementation results
3. Electrical implementation
4. Thermal circuit implementation
5. Implementation pictures
6. Conclusion

Trigeneration /Combined Heat and Power
1. Overview

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A. Definition

Tri-generation is the process whereby a single fuel source, natural gas (in our case), is used to produce both electrical and thermal energy (cooling and heating).

Current situation:
- Electricity → Distribution → Electrical power
- Electricity → Chillers → Cooled water
- Gas → Heating system → Hot water

Tri-Cogeneration:

Gas →

- → Electrical power 1.56 MW
- → Hot water
- → Cooled water 1.3MW

Hot water and cooled water: Using absorption chiller 1.65 MW

Classical power plant
Efficiency ≈ 30%
High operating cost

Trigeneration
Efficiency ≈ 90%
CO_2 reduction ≈60%
Automatic, zero headcount

Remarks:
- Usually fossil-fueled power plants have a efficiency of 33%. TSR implementation use actively 90% of the gas energy to produce electrical energy and heat & cold
- TSR CHP protect the production lines and critical utilities in case of city line electricity breakdown

Trigeneration /Combined Heat and Power
1. Overview, advantages

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B. Advantages:

› **Efficiency Benefits**
CHP requires less fuel to produce a given energy output and avoids transmission and distribution losses that occur when electricity travels over power lines. The average efficiency of fossil-fueled power plants is 30-35 %. Average CHP efficiency is 60-80% some systems could reach 90%.

› **Environmental Benefits**
Because less fuel is burned to produce each unit of energy output and because transmission and distribution losses are avoided, CHP reduces emissions of greenhouse gases and other air pollutants. Usually electricity distribution loss is around 4.5%.

› **Economic Benefits**
CHP can save facilities considerable money on their energy bills due to its high efficiency, and it can provide a hedge against electricity cost increases.

› **Reliability Benefits**
Unreliable electricity service represents a quantifiable business, safety, and health risk for some companies and organizations. CHP is an on-site generation resource and can be designed to support continued operations in the event of a disaster or grid disruption by continuing to provide reliable electricity.

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2. Implementation results

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Category	Results
Energy deliver to production area	1350 KW
Protect SMT lines	√
Protect assembly lines	√
Generator usage/load	98%
Generator heat reuse for cold industrial water	√ - location level
Installation impact to logistic & production	low
Generator heat usage for winter heating	√ - location level

Trigeneration /Combined Heat and Power
3. Electrical Implementation

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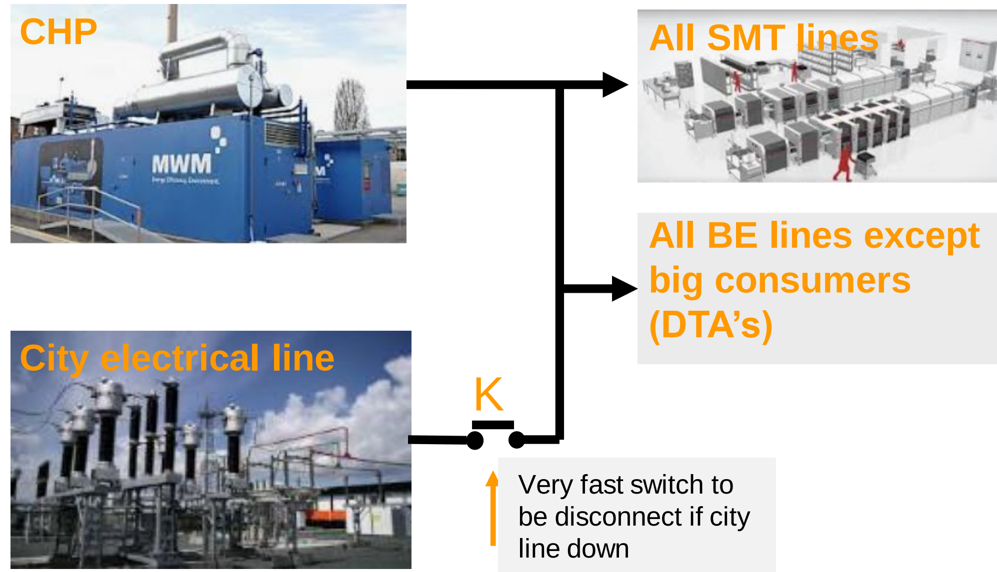
Remarks:

1. CHP power all the production busbars and normally is connected in parallel with Enel network. The extra generator power is transfer to Conti electrical network using switch K;
2. If city network power down occur the switch is fast disconnected and generator will power only the production area and some utilities;
3. CHP capacity allow to continue the production in SMT lines and finalize the processes on BE lines.
4. When the city power is restore automatically the generator is synchronize with the city line and the switch will be close automatically.



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3. Electrical Implementation

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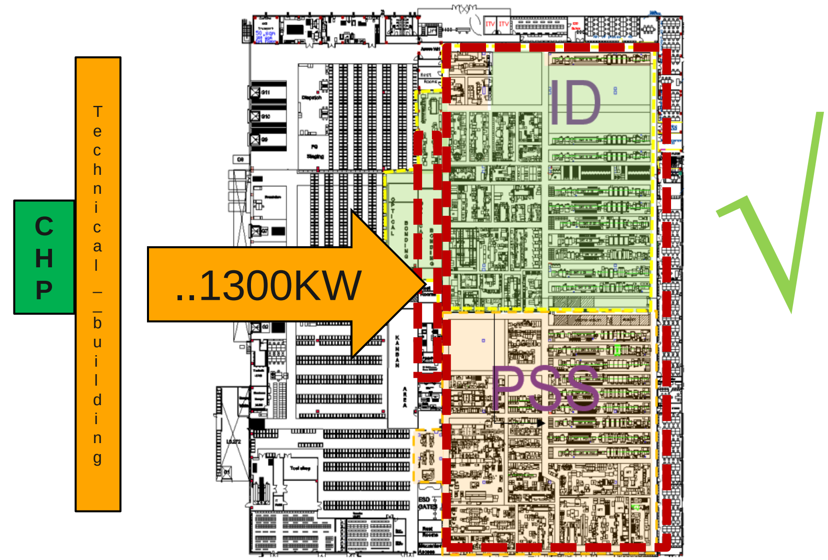
Electrical connection

CHP/generator is connect to production lines busbars and to the mandatory utility (exhaust, compress air, technological water) .



Power interruption cost avoidance

1. For PCB production/SMT lines even very short power interrupt create direct scrap (19 lines*20 PCB’s*30 € = 11400 €) and quality risks;
2. All the machines and traceability system after power interruption need to be restart (average 30 minutes production impact);
3. Power interrupt create often damage for production equipment and infrastructure equipment fault;
4. After power interruption, in assemble line all the product in the line need to be check/review at analyze station.

Direct impact: scrap reduction, production efficiency increase and reduce quality risks.

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3. Electrical Implementation

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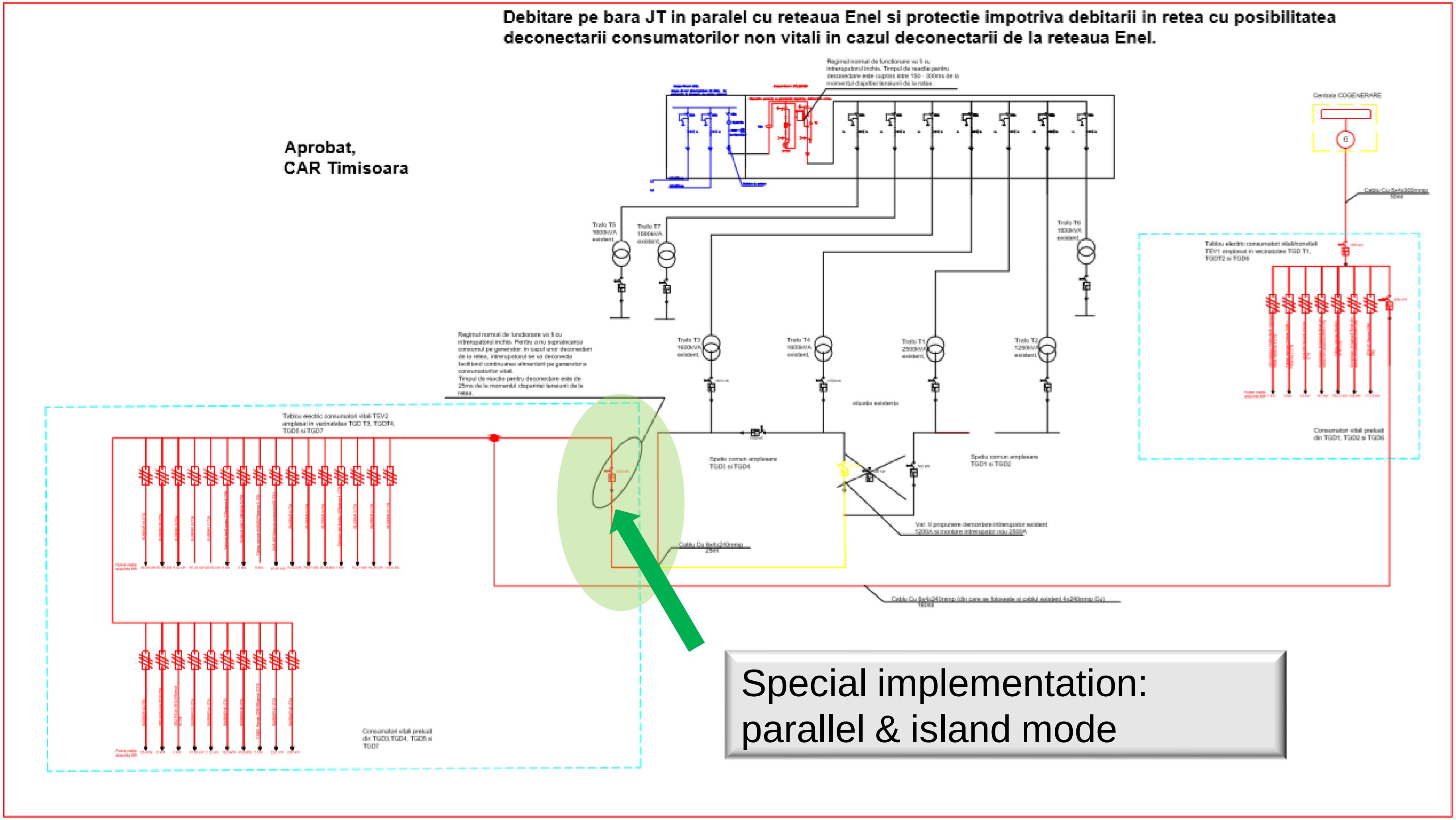

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Trigeneration /Combined Heat and Power
4. Thermal circuit Implementation

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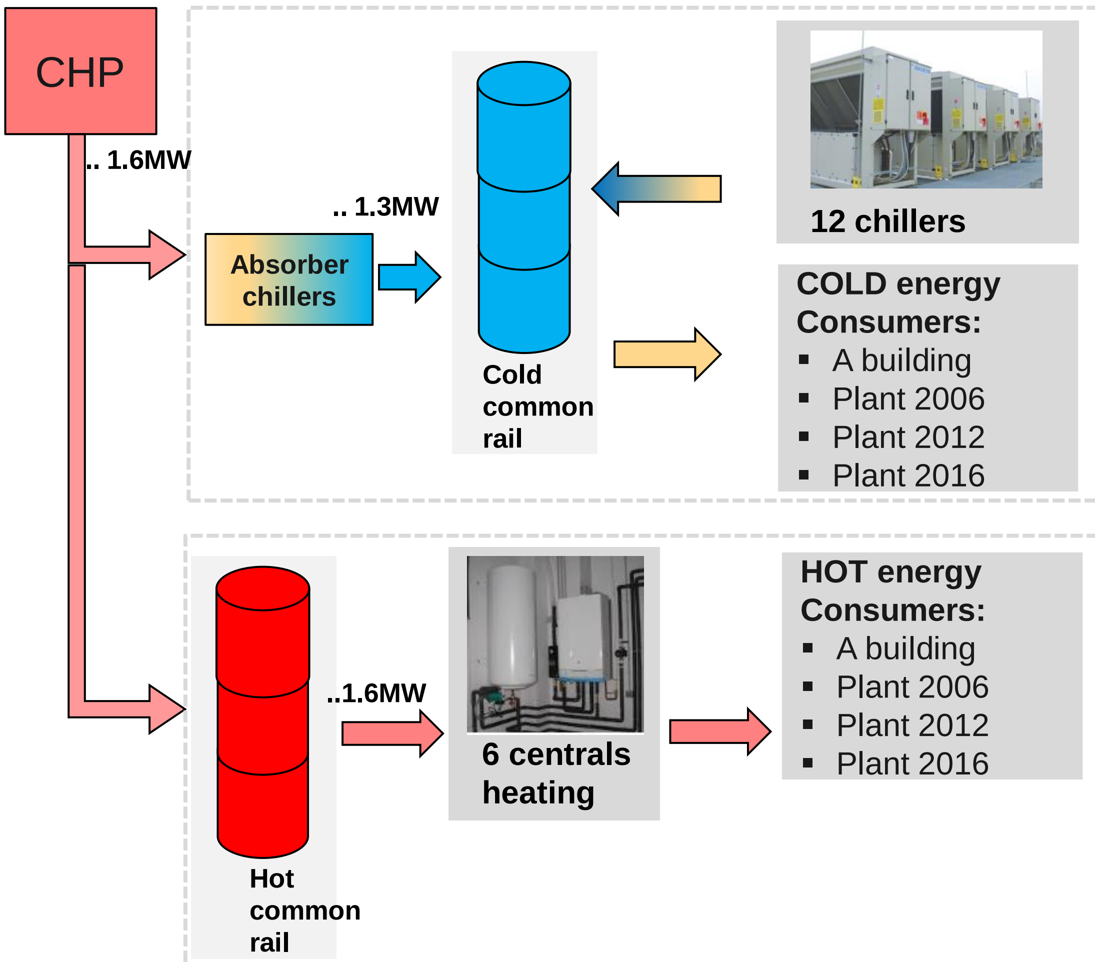

Cold water:

Production capacity:

CHP: 1.3MW
Chillers: 7.3MW
Free cooling (winter): 1,7MW

Consumption:

A building: 3,1 MW
Plant 2006 + B Building: 2,6MW
Plant 2012: 1MW
Plant 2016: 2,4MW

Hot Water:

Production capacity:

CHP:1,7 MW
With Burner :5,8MW

Consumption:

A building: 1,7 MW
Plant 2006-2012 + B Building: 2,8MW
Plant 2016: 1,3MW

1. With common rails CHP generate thermal energy for location!!!
2. Thermal efficiency increase with common rail cold and hot implementation!!!

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5. Implementation steps /foundation

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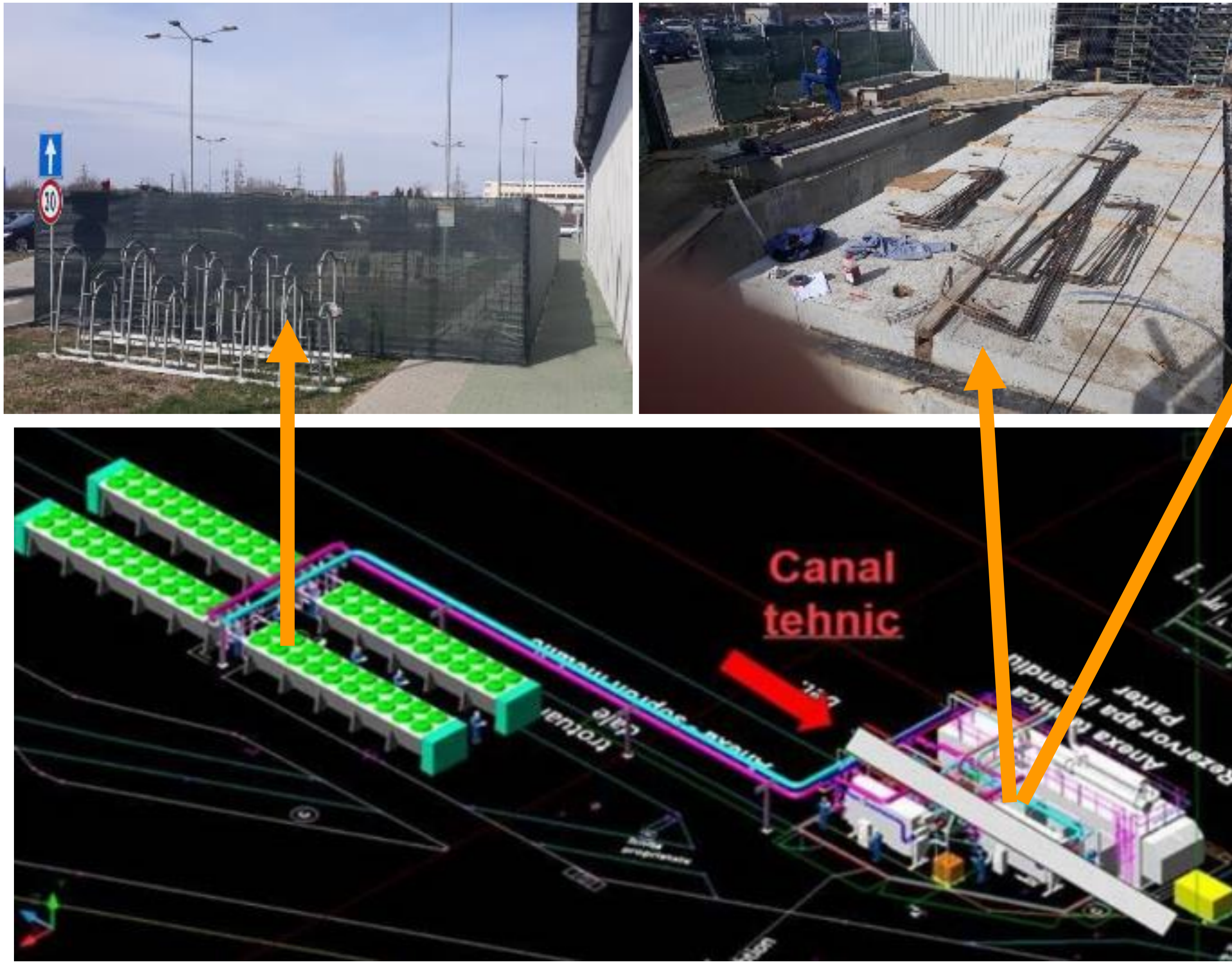

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5. Implementation steps /installation

Fig. Generator 50T in air

Fig. Adiabatic chiller

Fig. Heat exchanger

Fig. Inside generator

1.5 MW engine..

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5. Implementation steps /Electrical circuit

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Fig. Technical mezzanine (cable par prepared, main cables placed

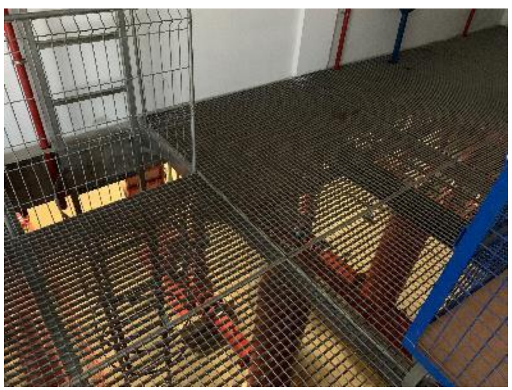

Fig. Technical area and technical channel, electrical cable placed

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5. Implementation steps /Thermal circuit

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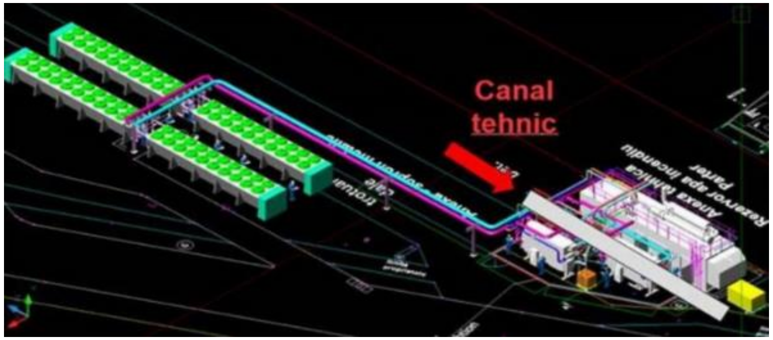

Fig. Hydraulic circuit to be implement

Fig. Actual adiabatic chiller

Fig. Connection adiabatic chiller

Fig. Technical room was close

Fig. Connection to common rail cold

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5. Implementation steps /Thermal circuit

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5. Final implementation

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Fig. CHP container- Motor

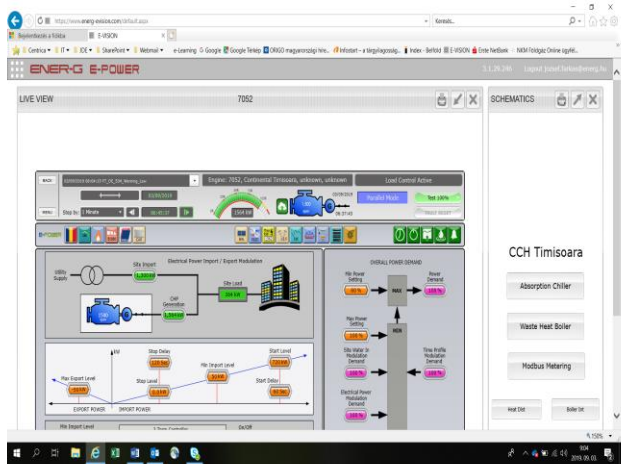

Fig. Electrical load 100% /parallel mode

Fig. CHP room – thermal circuit

Fig. CHP room – absorber chillers

Fig. CHP room – electrical control

Fig. CHP chillers

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Conclusion

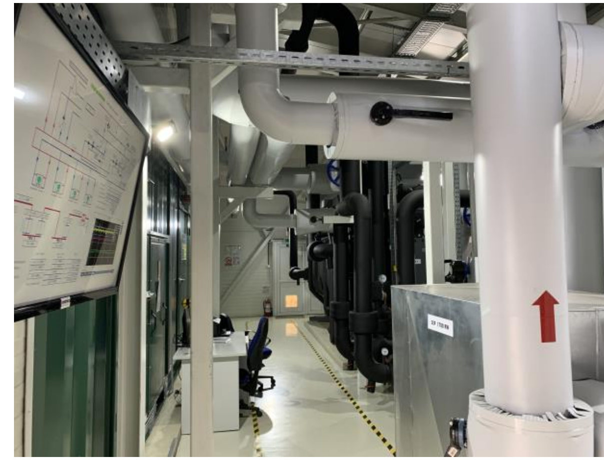

Fig. No personal, remote monitoring

Results:

1. Protect production area and general the electrical distribution line again the electrical power variations (average 10 times /month)
2. Run 24/24, 7 days/week
3. Implementation use 90% of gas energy (electric, heat, cooling)
4. Automatic solution, remote monitor and control
5. Low maintenance cost, engine running constantly
6. Important reduction for CO_2 compare with classical solutions

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Fig. Automatic solution

Thank you
for your attention!

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CBS
Continental Business System