

EINSTEIN in France
Thermal Energy audit of specialty paper drying process

AHLSTROM

SUNVALOR

Energy audit

- SUNVALOR
- Energy audits in France, small and mid size requirements
- Ahlstrom, company presentation
- Drying process
- Energy balance
- Alternatives
- Economics

SUNVALOR

SUNVALOR

Maitrise d'œuvre
Economie de la construction
BET Structure
BET VRD
BET Services et Energies
BET SSI
Direction des travaux
Développement HQE
Assistance à Maitrise d'Ouvrage

OPOIBI
L'INGÉIERIE QUALIFIÉE

SUNVALOR
Etudes et conseil
Etudes thermique
Audit énergétique bâtiment
Audit Énergétique Procédés industriels
Etudes de faisabilité Energie renouvelables
Bilan Carbone
Impact environnemental

BILAN CARBONE

SUNVALOR

EE in Rhône Alpes

- Small and mid size companies are vulnerable and see there energy intensity increasing over last years
- Limited inhouse knowledge in energy efficiency
- Limited time dedicated for energy efficiency

Source: énergie climat Rhône alpes:
Energy efficiency in industry 24fev 2011

Categorie	Consommation (TWh)	Pourcentage
Total énergies	64,2	43 %
Electricité	~40	~25 %
Combustibles	~20	~15 %

Categorie	Consommation (TWh)	Pourcentage
Moteurs	23,4	38 %
Chaud	12,3	19 %
Ventilation	5,8	9 %
Autres	15,1	24 %
Chauffées	7,6	12 %

SUNVALOR

Company presentation

AHLSTROM

- 5700p and over 2bio€ sales
- AHLSTROM site, near Grenoble, 110p, 7500T
- European leader in specialty paper and adhesives with application in the medical sector, food and filtration...

SUNVALOR

Energy Audit: drying process

Legend: ● Comptage - débit/mètre ● Calcul

SUNVALOR

Energy Audit: drying process

SUNVALOR
Expertise Energie & Environnement

The Honey comb dryer 'THRU-DRYER'

- Air temperature
- Air flow
- Humidity

Better control of fresh air inflow, pre heated through a new HX with hot humid air outflow
Better control of humidity in the air system

SUNVALOR



SUNVALOR
Expertise Energie & Environnement

- Few issues

The line produces 250 grades
Grade produced use a wide variety of cellulose and synthetic fibers
Circa 3 grades changes a day
Matter flow difficult to model in this open system

- Few tricks

4 grades can replace 250
Temperature between 160 and 210°C
Output between 7000 and 12500kg/h (dry air)
Continuous batch, no start up and no maintenance, no waste heat in the distribution duct

SUNVALOR

SUNVALOR
Expertise Energie & Environnement

Process	UPH Load (kW/m ²)	Share (%)	Circulation (MMH)	Maintenance (MMH)	Start Up (MMH)	Preco Temp (°C)	Preco Supply Temp (°C)
1 Honey comb 16gr/m ²	4226.92	39.76	4226.92	0.00	0.00	162.00	162.00
2 Honey comb 11gr/m ²	1333.15	12.54	1333.15	0.00	0.00	105.00	105.00
3 Honey comb 47gr/m ²	326.83	6.64	326.83	0.00	0.00	116.00	116.00
4 Honey comb 75gr/m ²	4245.07	40.30	4245.07	0.00	0.00	219.00	219.00
Total	6999.95	100.00					

Distribution of process heat demand (UPh Total) by processes

SUNVALOR

Alternatives

SUNVALOR
Expertise Energie & Environnement

- HX
- CHP gas turbine
- Solar thermal
- HX+CHP

Performance Curves

HX Network

- Run design assistant
- Add HX manually
- Consider existing HX in network selection

Configuration

- Configure design assist
- Display Options

Existing heat exchangers in the system

Name	Power (kW)	in (°C)	out (°C)	T1 forward (°C)	T1 cold inlet (°C)	T1 cold outlet (°C)
1 HX16gr/m ²	4226.92	162	105	36.8	10.0	10.0
2 HX47gr/m ²	326.83	116	105	45.4	10.0	10.0
3 HX75gr/m ²	4245.07	219	116	47.4	10.0	10.0
4 HX11gr/m ²	1333.15	105	162	46.0	116.0	116.0
5						

320Kw HX / 270m²
Pre heat inflow from 20 to 120°C in winter and from 40 to 110 in summer.

SUNVALOR

Alternatives

SUNVALOR
Expertise Energie & Environnement

- HX
- CHP gas turbine
- Solar thermal
- HX+CHP

CHP equipment in the HC Supply system

Unit name	New power (kW)	CO ₂ dL/kWh	Type	Opening hours	
1 New CHP	500	930.0	3200.000	CHP gas turbine	7755.0
2					
3					

Design assistant options:

- Maintain existing equipment
- run design assistant

CHP System Type

- CHP System Type: CHP gas turbine
- Fuel Type: Natural gas
- Minimum operating hours: 4000.0
- Min. electrical efficiency (ef%) [%]: 5.3

Cumulative heat demand to be covered by CHP

System Performance Data

CHP Unit	CHP Power (kW)	Efficiency (electrical)	Temperature (°C)	Demand (kWh, op. hours [%])
1	500	0.82	215.5	1000 (4000.0)
2			233.5	1000 (4000.0)
3			200.144	300 (7755.0)

CHP gaz turbine 500Kw el / 938Kw th

SUNVALOR

Alternatives

SUNVALOR
Expertise Energie & Environnement

- HX
- CHP gas turbine
- Solar thermal
- HX+CHP

Solar collector

Collector model	Collector type	a	c1	c2	E(P ₀) (m ² /K ²)	R(P ₀) (W/m ²)
ET250max	Evacuated tube collector	0.790	1.200	0.000	0.940	1.100

choose solar collector run design assistant

Heat demand and solar contribution

Layout of solar thermal system

Installed capacity [kW]	1852.20
Efficiency of heat storage and distribution [%]	0.93
Solar collector type	Evacuated tube collector
Nominal annual energy yield [GWh/yr]	600.00

General data sheet for simulation

Gross surface area of collector for simulation [m ²]	1000.00
Maxim possible solar thermal capacity [kW]	1334.36
Solar fraction up to 200°C [%]	11.41
Annual energy yield [GWh/yr]	600.00
Average system efficiency [%]	32.12
Average operating temperature (sol.) [°C]	-

SUNVALOR

SUNVALOR
Expertise Energie & Environnement

- HX
- CHP gas turbine
- Solar thermal
- HX+CHP**

CHP equipment in the IC Supply System

Sheet name	New plant	COP	Type	Operat.
1	New CHP 5	300	563.5.330.6.800 CHP gas turbine	2
2				
3				

Cumulative heat demand to be covered by CHP

Design assistant options:

Handle existing equipment ?

System Performance Data

CHP System Type	CHP gas turbine
Pellet Type	Natural gas
CHP Operating hours	7702.00
effective electrical efficiency	0.60
Temperature [°C]	32.37
T<0	0.02
Minimum operating hours	4000.0
T>120	1.00
Min. electrical efficiency [ef.] [%]	0.55
Demand at min. op. hours [W]	1595.09
T<0	1.00
Total	1595.09

CHP 300Kw el/563kw th +

SUNVALOR

Energy consumption

SUNVALOR
Expertise Energie & Environnement

Consommation énergétique primaire (PEC)

Alternative	Consommation énergétique primaire [MWh]	Economies [MWh]	Economies [%]
1 Present State (checked)	14951.20	1534.47	10.56
2 solar thermal	8029.75	8142.13	41.05
3 Cogénération	10350.59	4601.50	36.78
4 Echangeur + Cogénération	11051.80	3100.00	23.73
5 Échangeurs			
6			

Comparaison relative de la PEC

SUNVALOR

IRR

SUNVALOR
Expertise Energie & Environnement

Taux de rendement interne (TRI) modifié

Alternative	Taux de rendement interne modifié [%]	Délat de récupération [année]	Rapport coûts-bénéfice [-]
1 Present State (checked)	-23.30	4.00	
2 solar thermal	45.48	1.04	
3 Cogénération	17.45	3.07	
4 Echangeur + Cogénération	38.92	1.31	
5 Échangeurs			
6			

Comparatif du taux de rendement interne

SUNVALOR

CO2 impact

SUNVALOR
Expertise Energie & Environnement

Impact environnemental de l'activité

Alternative	Production de CO2 [t]	Déchet nucléaire HauteMENT Radiatif [kg]	Consommation d'eau [m ³]
1 Present State (checked)	3398.16	0.06	0.00
2 solar thermal	3043.96	0.06	0.00
3 Cogénération	3906.73	-19.40	0.00
4 Echangeur + Cogénération	3082.58	-7.44	0.00
5 Échangeurs	2693.59	0.00	0.00
6			

Comparaison relative des différentes alternatives

SUNVALOR

chosen alternative

SUNVALOR
Expertise Energie & Environnement

- The HX is being seized and included in the current investment
- CHP is the next step
- Air waste other drying system 200000m³/h to be retrieved

SUNVALOR

