

Context/Intro:

In the framework of the ICaRE4Farms project, this document aims at reviewing the real-life potential of Fengtech STE system within the agricultural sector of dairy farms.

The current real-life example focus on a holding set in Le Mans (France). This farm currently hosts around 70 cows for which it needs 13 762 kWh of energy supply per year in order to clean the milking parlours and tanks.

After enumerating the main characteristics of this field application farm before installing STE plants, a review of functioning with the Fengtech system illustrating expected results will be tackled.

This file complements previous work on case studies and offer a more localised illustration.

PART II: FIELD APPLICATION CASE

- | | |
|--|--|
| ▶ <i>N°/Nickname:</i> French Dairy Case | ▶ <i>Location (Country/Region):</i>
France / Pays de la Loire |
| ▶ <i>Type of holding:</i>
Dairy Farm (without on-farm processing) | ▶ <i>Date:</i> October 2021 |

1 Initial characteristics of the installation: (Use Market Analysis + Technology Assessment)

- **Number of cows:** 70 cows
- **Type of production:** Milk
- **Water Use (frequency, quantity, timeframe, etc):** Cleaning of Milking Parlours & Milk tanks
- **Frequency:** 2 times a day
- **Quantity:** 400-500L at 70°C per day
- **Version of FT STE system:** ETF 2 (version with pressure)
- **Temperature needed (in °):** 65°C
- **Standard fossil energy used:** Electric Boiler (2 units of 3kW and 300L)
- **Price per kWh:** 0.16 *EXCL. TAX/€/kWh*
- **Energy consumption for the activity (in kWh):** 13 762 kWh/year
cf. with energy waste and to heat 400L of water per day all year long, the energy need accounts for 13 762 kWh/year
- **Expenditure of energy consumption (in €/kWh):** 2 202 € *EXCL. TAX/year*
cf. 0.16 €/kWh x 13 762 kWh/year = 2 201.92 € *EXCL. TAX/year*
- **Available subsidies for STE:** between 20 and 40% of the equipment cost (*Fonds Chaleur*)
- **Amount of CO2 emission:** 1376 kg CO2/year
cf. given that 1kWh produces about 0.1kg CO2(eq), 0.1kg CO2/kWh x 13 762 kWh/year = 1 376.2 kg CO2/year

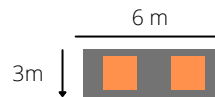
Prerequisites of installation:

- Located on floor or roof
- Preference = South-West facing
- Not far from the holding to avoid additional energy needs for re-heating

Employed Version of the matrix = V11 Lilles Study Case

2 Simulation with a Feng Tech STE system:

- **Coverage Rate of the installation (Share of utilisation in %):** 64% (GOAL = at least 50%)
- **Number of STE units to reach the energy needs:** 2 units
cf. potential energy savings = 8 859 kWh/year
- **Overall front surface of capture:** 8 m²
cf. 1 FT = 4m² ; 4m²/unit x 2 units = 8 m²
- **Maximum attainable temperature with the current solution (in °):** 100°T (optimal conditions)
- **Power (kW/unit):** 2.5kW/unit
- **Number of sensors needed for remote surveillance and monitoring:**
Commercial scope = 2 thermometers + 2 flowmeters
- **Surface requirement for the equipment:** 3x6 = 18m²



- **Irradiance & Cold Water Measurements:**

valeurs d'irradiation (Calsol INES)	Le MANS	Albedo	0,8												
Unité (kWh / m ² / jour)	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Septembre	Octobre	Novembre	Décembre	Année		
Irradiation Direct	1,09	1,25	2,43	3,09	2,43	2,43	2,87	2,66	2,3	2,1	1,3	0,78	2,08		
Irradiation Diffus	0,58	0,9	1,38	1,87	2,31	2,48	2,36	2,07	1,59	1,07	0,68	0,48	1,48		
Température eau froide °C	7,5	7,8	9,4	11	12	14	15	15	14	11	9,3	7,8	11		

- **Solar energy contribution (Energy Savings in kWh):** 8 859 kWh/year
 - Yearly Basis: 3 FT STE units' full potential = **8 859 kWh/year** (relating to a specific simulation case)
cf. it corresponds to 6 202 kWh/year useful solar energy (depends on distance, insulation etc. / simulation from an average case)
 - Daily energy consumption saving: 8 859 kWh / 365 days = **24.3 kWh/day**
- **Savings on energy consumption (in €):** 1 417€ EXCL. TAX/year
cf. Given that, with energy waste and to heat 400L of water, the energy saving accounts for 8 859 kWh/year x 0.16€ = 1 417.44 €/year
- **Remaining share of the standard energy used (per year):** 784 €/year (36% ; 4 903 kWh/year)
 - In %: solar thermal energy represents 64% here so, remaining share of **36%**
 - In kWh: 13 762 - 8 859 = **4 903 kWh/year**
 - In €: 4 903 kWh/year x 0.16 €/kWh = **784.48 €/year**
- **Remaining emission of CO₂:** 490 kg CO₂ (CO₂ reduction up to 886 kg CO₂)
cf. 4 903 kwh/year x 0.1kg CO₂ = 490,3 kg CO₂

Hyp = No AIDS

- **Previsionnal Cost (total - subsidies): 12 000 €**

cf. cost of equipment & installation + site preparation - potential aids = previsionnal cost

- **Cost of the equipment & installation: 10 000€**

Notes: 3829€ for one stainless steel unit + installation expenses = 5000€/unit / 2 units x 5000€/unit = 10 000€

- **Cost of the site preparation: 2000€**

cf. in average if not done personally by the holder

- **Aids and subsidies available: 0€**

cf. grant = 0% in the event of approval by regulating authorities

OPTIONAL COST: monitoring = 1200€ (equipment) + 1200€ (installation) + 38 €/year (RESOL subscription)

- **Financial Package : 1 278 €/year for 10 years (in average)**

cf. Total - subsidies ; cash + financial loan (= duration + annuity)

- Previsionnal cost = financial loan = **12 000€**

- Duration: **10 years** / Loan rate = **1.27%** (with yearly increase) / STE Durability = **+30 years**

=> **12 000 € / 10 years = 1 200 €/year** ; taking into account the loan payment: **1 278 €/year** (in average)

- **Return on investment (global expense / annual savings): 8 years & 6 months**

- Global expense = **12 000€**

- Annual energy savings = **1 417 € per year** during 30 years so in total : 1 417 €/year x 30 years = **42 510 €**

- ROI = 12 000 € / 1 417 € = **8.47 years**

- ROIC = 1 417 € / 12 000 € = **11.8 %**

- **Yearly Earnings (Annual savings and yearly loan payment): 139 €/year (for 10 years, then 1 417 €/year)**

cf. good if savings > loan

- Annual savings = **1 417 €**

- Yearly loan payment = **1 278 €**

- Difference = 1 417 - 1 278 = **139 €/year of earnings on the 10 year-loan period / after = 1 417 €/year**

	Année	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Charge sans solaire	2202	2356	2521	2697	2886	3088	3304	3536	3783	4048	4331	4635	4959	5306	5678	6075	6500	6955	7442	7963
2	Remboursement emprunt	1278	1278	1278	1278	1278	1278	1278	1278	1278	1278	0	0	0	0	0	0	0	0	0	0
3	Gaz restant à acheter	784	839	898	961	1028	1100	1177	1260	1348	1442	1543	1651	1767	1890	2023	2164	2316	2478	2651	2837
4	Entretien du système	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
5	Charge avec solaire (2+3+4)	2063	2118	2177	2239	2307	2579	2662	2750	2845	2946	1775	1890	2013	2144	2284	2433	2593	2763	2945	3139
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Eco d'énergie (1-5) €HT/an	139	238	344	458	580	510	643	786	939	1102	2557	2745	2947	3163	3394	3642	3908	4192	4497	4824
7	Eco d'énergie €HT /mois	12	20	29	38	48	42	54	65	78	92	213	229	246	264	283	304	326	349	375	402

- **Network of installers:** Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / INOVIA (Ancien du Groupe Terrena) / SARL TESSIER / Comptoir machine à traire (CMT) / CES Tardy - EMERAUDE ELEVAGE EQUIPEMENT / Energies libres / M. ENERGIES Thermiques / Boissinot Elevage / Animat53 / Sarl Evident / AB Energies / MODEMA Agri / ALDS Duval Services / Méheust / Bretagne Sud Elevage (BSE) / Roudaut-Foricher / Sotec

- **Legislation for installation/Procedures and precautions:** rural environnement so few restrictions ; when roof, request for work to municipality / when on the floor, nothing needed as long as within property



Hyp = 30% AIDS

- **Previsionnal Cost (total - subsidies): 9 000 €**

cf. cost of equipment & installation + site preparation - potential aids = previsionnal cost

- **Cost of the equipment & installation: 10 000 €**

Notes: 3829€ for one stainless steel unit + installation expenses = 5000€/unit / 2 units x 5000€/unit = 10 000€

- **Cost of the site preparation: 2000 €**

cf. in average if not done personally by the holder

- **Aids and subsidies available: 3 000 €**

cf. average grant = 30% ; 10000 x 0.30 = 3000 € *in the event of approval by regulating authorities*

OPTIONAL COST: monitoring = 1200€ (equipment) + 1200€ (installation) + 38 €/year (RESOL subscription)

- **Financial Package : 959 €/year for 10 years (in average)**

cf. Total - subsidies ; cash + financial loan (= duration + annuity)

- Previsionnal cost = financial loan = **9 000 €**

- Duration: **10 years** / Loan rate = **1.27%** (with yearly increase) / STE Durability = **+30 years**

=> **9 000 € / 10 years = 900 €/year** ; taking into account the loan payment: **959 €/year** (in average)

- **Return on investment (global expense / annual savings): 6 years & 4 months**

- Global expense = **9 000 €**

- Annual energy savings = **1 417 € per year** during 20 years so in total : 1 417 €/year x 30 years = **42 510 €**

- ROI = 9 000 € / 1 417 € = **6,35 years**

- ROIC = 1 417 € / 9 000 € = **15.7%**

- **Yearly Earnings (Annual savings and yearly loan payment): +1021€/year (for 10 years, then 2576€/year)**

cf. good if savings > loan

- Annual savings = **1 417 €**

- Yearly loan payment = **959 €**

◦ Difference = 1 417 - 959 = **458 €/year of earnings on the 10 year-loan period / after = 1 417 €/year**

	Année	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Charge sans solaire	2202	2356	2521	2697	2886	3088	3304	3536	3783	4048	4331	4635	4959	5306	5678	6075	6500	6955	7442	7963
2	Remboursement emprunt	959	959	959	959	959	959	959	959	959	959	0	0	0	0	0	0	0	0	0	0
3	Gaz restant à acheter	784	839	898	961	1028	1100	1177	1260	1348	1442	1543	1651	1767	1890	2023	2164	2316	2478	2651	2837
4	Entretien du système	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
5	Charge avec solaire (2+3+4)	1743	1798	1857	1920	1987	2259	2342	2431	2525	2626	1775	1890	2013	2144	2284	2433	2593	2763	2945	3139
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Eco d'énergie (1-5) €HT/an	459	558	664	778	899	829	962	1105	1258	1422	2557	2745	2947	3163	3394	3642	3908	4192	4497	4824
7	Eco d'énergie €HT / mois	38	46	55	65	75	69	80	92	105	119	213	229	246	264	283	304	326	349	375	402

- **Network of installers:** Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / INOVIA (Ancien du Groupe Terrena) / SARL TESSIER / Comptoir machine à traire (CMT) / CES Tardy - EMERAUDE ELEVAGE EQUIPEMENT / Energies libres / M. ENERGIES Thermiques / Boissinot Elevage / Animat53 / Sarl Evident / AB Energies / MODEMA Agri / ALDS Duval Services / Méheust / Bretagne Sud Elevage (BSE) / Roudaut-Foricher / Sotec

- **Legislation for installation/Procedures and precautions:** rural environment so few restrictions ; when roof, request for work to municipality / when on the floor, nothing needed as long as within property

RELEVANT REMARKS & COMMENTS
