

Context/Intro:

In the framework of the ICaRE4Farms project, this document aims at reviewing the real-life potential of Feng Tech STE system within the agricultural sector of milk-fed calf farms.

The current real-life example focus on a holding set in Sarthes county (France). This farm currently hosts around 800 calves a year (i.e. 1.8 lots of 400 places), for which it needs around 90 068 kWh of energy supply per year in order to feed th calves with heated milk (powder + hot water).

After enumerating the main characteristics of this field application farm before installing STE plants, a review of fonctionning 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

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|--|---|
| <ul style="list-style-type: none"> ▶ <i>N°/Nickname:</i> French Calves farms ▶ <i>Type of holding:</i> ▶ Milk-Fed Calves Breeding | <ul style="list-style-type: none"> ▶ <i>Location (Country/Region):</i> France / Pays de la Loire / Sarthes ▶ <i>Date:</i> Octobre 2020 |
|--|---|

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

- **Number of cows:** 800 calves/year (2 lots of **400** places per year)
- **Water Use (heating/direct use):** Feeding of Calves with heated milk
 - **Frequency:** 2 times a day
 - **Timeframe:** morning and evening
 - **Quantity:** 2000 L/day
- **Version of FT STE system:** ETF 1 (version without pressure)
- **Temperature needed (in °):** 80°C
- **Standard fossil energy used:** Propane
- **Price per kWh:** 0.12 EXCL. TAX/€/kWh
- **Energy consumption for the activity (in kWh):** 90 068 kWh/year
cf. with energy waste, the energy need accounts for 90 068 kWh/year
- **Expenditure of energy consumption (in €/kWh):** 10 808 € EXCL. TAX/year
cf. 0.12 EXCL.TAX/€/kWh x 90 068 kWh/year = 10 808.16 EXCL. TAX €/year
- **Available subsidies for STE:** between 20 and 40% of the equipment cost (*Fonds Chaleur*)
- **Amount of CO2 emission:** 24 498,5 kg CO2/year
cf. given that 1kWh with propane produces about 0.272 kg CO2(eq), 0.272 kg CO2/kWh x 90 068 kWh/year = 24 498,496 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 Lille Study Case

2 Simulation with a Feng Tech STE system:

- **Coverage Rate of the installation (Share of utilisation in %):** 50% (GOAL = at least 50%)
cf. precisng when the farmer wanted willingly a restricted share of power supply + Depending on location and weather + the value is imposed as it is the hypothetical reference we want to check after with the field application case
- **Number of STE units to reach the energy needs:** 11 units
cf. potential energy savings = 45 210 kWh/year
- **Overall front surface of capture:** 44 m²
cf. 1 FT = 4m² ; 4m²/unit x 11 units = 44 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:** 3x33 = 99m²
- **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):** 45 210 kWh/year
 - Yearly Basis: 11 FT STE units' full potential = **45 210 kWh/year** (relating to a specific simulation case)
cf. it corresponds to **28 482 kWh/year useful solar energy** (depends on distance, insulation etc. / simulation from an average case)
 - Daily energy consumption saving : 45 210 kWh/year / 365 days = **123.9 kWh/day**
- **Savings on energy consumption (in €):** 5 425.2 € EXCL. TAX/year
cf. Given that, with energy waste, the energy saving accounts for 45 210 kWh/year x 0.12 €/kWh = 5 425.2 €/year
- **Remaining share of the standard energy used (per year):** 5 383 €/year (50% ; 44 858 kWh/year)
 - In %: solar thermal energy represents 50% here so, remaining share of **50%**
 - In kWh: 90 068 - 45 210 = **44 858 kWh/year**
 - In €: 44 858 kWh/year x 0.12 €/kWh = **5 382.96 €/year**
- **Remaining emission of CO₂:** 12 201 kg CO₂ (CO₂ reduction up to 12 297.5 kg CO₂)
cf. 44 858 kWh/year x 0.272kg CO₂ = 12 201.376 kg CO₂/year

Hyp = No AIDS

- Previsionnal Cost (total - subsidies): 60 000 €**

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

- Cost of the equipment & installation: 55 000€**

Notes: 3829€ for one stainless steel unit + installation expenses = 5000€/unit / 11 units x 5000€/unit = 55 000€

- Cost of the site preparation: 5000€**

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 : 6 392 €/year for 10 years (in average)**

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

- Previsionnal cost = financial loan = **60 000 €**

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

=> **60 000 € / 10 years = 6 000 €/year** ; taking into account the loan payment: **6 392 €/year** (in average per year for 10 years)

- Return on investment (global expense / annual savings): 11 years & 7 months**

- Global expense = **60 000 €**

- Annual energy savings = **5 425.2 € per year** during 30 years so in total : 5 425.2 €/year x 30 years = **162 756 €**

- ROI = 60 000 € / 5 425.2 € = **11.059 years**

- ROIC = 5 425.2 € / 60000 € = **9 %**

- Yearly Earnings (Annual savings and yearly loan payment): - 967 €/year (first year)**

cf. good if savings > loan

- Annual savings = **5 425 €**

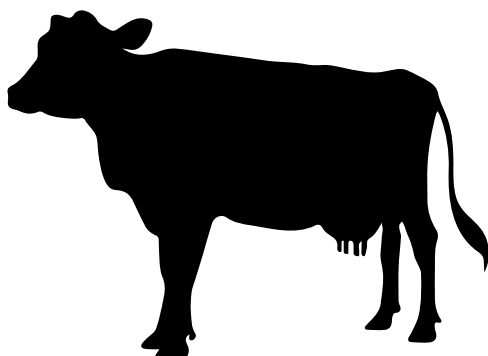
- Yearly loan payment = **6 392 €**

Difference = 5 425 - 6 392 = **- 967 €/year of earnings during the first year of the 10 year-loan period / after = 5 425 €/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	10808	11565	12374	13240	14167	15159	16220	17356	18570	19870	21261	22750	24342	26046	27869	29820	31907	34141	36531	39088
2	Remboursement emprunt	6392	6392	6392	6392	6392	6392	6392	6392	6392	6392	0	0	0	0	0	0	0	0	0	0
3	Gaz restant à acheter	5383	5760	6163	6594	7056	7550	8078	8644	9249	9896	10589	11330	12124	12972	13880	14852	15891	17004	18194	19468
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)	11775	12152	12555	12987	13448	14142	14677	15248	15860	16514	10821	11569	12370	13226	14141	15121	16168	17289	18488	19770
		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	-967	-587	-181	254	719	1017	1543	2107	2711	3357	10440	11180	11973	12820	13728	14699	15739	16852	18043	19318
7	Eco d'énergie €/HT /mois	-81	-49	-15	21	60	85	129	176	226	280	870	932	998	1068	1144	1225	1312	1404	1504	1610

- Network of installers:** Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / 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



WITH AIDS

- Provisionnal Cost (total - subsidies): 43 500 €**

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

- Cost of the equipment & installation: 55000€**

Notes: 3829€ for one stainless steel unit + installation expenses = 5000€/unit / 11 units x 5000€/unit = 55000€

- Cost of the site preparation: 5000€**

cf. in average if not done personally by the holder

- Aids and subsidies available: 16 500€**

cf. grant = 30% ; 55000 x 0.3 = 16 500€ in the event of approval by regulating authorities

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

- Financial Package : 4 634 €/year for 10 years (in average)**

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

- Provisionnal cost = financial loan = **43 500 €**

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

=> **43 500 € / 10 years = 4 350 €/year** ; taking into account the loan payment: **4 634 €/year** (in average per year for 10 years)

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

- Global expense = **43 500 €**

- Annual energy savings = **5 417.2 € per year** during 30 years so in total : 5 417.2 €/year x 30 years = **162 756 €**

- ROI = 43 500 € / 5 417.2 € = **8 years**

- ROIC = 5 417.2 € / 43 500 € = **12.45 %**

- Yearly Earnings (Annual savings and yearly loan payment): 783 €/year (first year then 5 417 €/year)**

cf. good if savings > loan

- Annual savings = **5 417 €**

- Yearly loan payment = **4 634 €**

- Difference = 5 417 - 4 634 = **783 €/year of earnings during the first year of the 10 year-loan period / after = 5 417 €/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	10808	11565	12374	13240	14167	15159	16220	17356	18570	19870	21261	22750	24342	26046	27869	29820	31907	34141	36531	39088
2	Remboursement emprunt	4634	4634	4634	4634	4634	4634	4634	4634	4634	4634	0	0	0	0	0	0	0	0	0	0
3	Gaz restant à acheter	5383	5760	6163	6594	7056	7550	8078	8644	9249	9896	10589	11330	12124	12972	13880	14852	15891	17004	18194	19468
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)	10017	10394	10797	11229	11690	12384	12919	13490	14102	14756	10821	11569	12370	13226	14141	15121	16168	17289	18488	19770
6	Eco d'énergie (1-5) €HT/an	791	1171	1577	2012	2477	2775	3301	3865	4469	5114	10440	11180	11973	12820	13728	14699	15739	16852	18043	19318
7	Eco d'énergie €HT/mois	66	98	131	168	206	231	275	322	372	426	870	932	998	1068	1144	1225	1312	1404	1504	1610

Network of installers: Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / 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

RELEVANT REMARKS & COMMENTS