North-West Europe ICARE4FARMS

CASE STUDY

I4F-WP1-Task 3



Context/Intro:

!!!!invent for academic/anonymise for field application case!!!!!

1

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 dairy farms.

The current real-life example focus on a holding set in Brittany (France). This farm currently hosts around 200 cows producing 1.8 Millions liter of milk a year, for which it needs around 79 269 kWh of energy supply per year in order to clean the milking parlours and tanks, plus processing on farm. After enumerating the main characteristics of this field application farm before installing STE plants, a review of functionning with the Feng Tech system illustrating expected results will be tackled. This file complements previous work on case studies and offer a more localised illustration.

PART I: ACADEMIC CASE

- ► *N°/Nickname:* Bretagne Laitier
- Location (Country/Region): Brittany
- Type of holding: Dairy Farm
- Date: 08/04/2022

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

- Size of the surface/number of animals: 200 cows producing 1.8 M L of milk over 250 ha of lands
- Water Use (heating/direct use): Cleaning milking parlours & tanks + on-farm processing (2000L/day)
 - Frequency: twice per day (2x about 1000L)
 - **Timeframe:** on-farm processing every day + cleaning = morning and afternoon
 - Quantity: about 2000 L / 1/3 cleaning v 2/3 processing
- Version of FT STE system (ETF 1 / ETF2) : ETF2
- Temperature needed (in °): 70°
- Standard fossil energy used: electricity
- Price of fossil energy per kWh: 0.152€/kWh



- Energy consumption for the activity (in kWh/year): 79 269 kWh/year cf.with energy waste and differentiated needs depending on the period of the year, the energy need accounts for 79 269 kWh/year
- Expenditure of energy consumption (in EXCL TAX€/year): 12 049 EXCL. TAX €/year cf. 0,152 EXCL.TAX/€/kWh x 79 269 kWh/year = 12 048.8 EXCL. TAX €/year
- Available subsidies for STE: 0€
- Amount of CO2 emission: 14 268 CO2/year cf. given that 1kWh of electricity produces about 0,180 kg CO2(eq), 0,180 kg CO2/kWh x 79 269 kWh/year = 14 268.42 kg CO2/year

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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 = V10 Lille Study Case

2 <u>Simulation with a Feng Tech STE system:</u>

- Coverage Rate of the installation (Share of utilisation in %): 43% cf. precising 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: 7 panels cf. potential energy savings = 21 706 kWh/year
- Overall front surface of capture: 28m2 cf.1 FT = 4m2; 4m2/unit x 7 units = 28m2
- 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: Possibility for 2 thermometers + 2 flowmeters BUT not expressively mandatory
- Surface requirement for the equipment: 3x21 = 63m2
- Irradiance & Cold Water Measurements:

valeurs d'irradiation (Calsol INES)	Brest 45°	Albedo	0,8										
Unité (kWh / m² / 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	2,06
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

3m

• Solar energy contribution (Energy Savings in kWh/year): 34 453 kWh/year => 94.4 kWh/day

• Yearly Basis: 7 FT STE units' full potential = **34 453 kWh/year** (relating to a specific simulation case)

cf. it corresponds to 21 706 kWh/year of useful solar energy (depends on distance, insulation etc.)

- \circ Daily energy consumption saving: 34 453 kWh/year / 365 days = **94.39 kWh/day**
- Savings on energy consumption (in €): 5 237 € EXCL. TAX/year

cf. the energy saving accounts for 34 453 kWh/year x 0,152 \in /kWh = 5 236.8 \in /year

• Remaining share of the standard energy used (per year): 6 812 €/year (57%; 44 816 kWh/year)

 $\,\circ\,$ In %: solar thermal energy represents 43% here so, remaining share of ${\bf 57\%}$

- In kWh: X1 X2 = 79 269 34 453 = **44 816 kWh/year**
- In €: 44 815 kWh/year x 0,152 €/kWh = 6 812.032 €/year
- Remaining emission of CO2: 8 066.7 kg CO2 (CO2 reduction up to 6 0201.3 kg CO2) cf. 44 815 kwh/year x 0,180 kg CO2 = 8 066.7 kg CO2

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Hyp = No AIDS Previsionnal Cost (total - subsidies): 40 000€ cf. cost of equipment & installation + site preparation - potential aids = previsional cost Cost of the equipment & installation: 35 000€ Notes: 3829€ for one stainless steel unit + installation expenses = 5000€/unit / 7 units x 5000€/unit = 35 000 € • Cost of the site preparation: 5000€ cf. in average if not done personally by the holder Aids and subsidies available: 0€ cf. average grant = XXX % ; X1 x X2 = XXX € *in the event of approval by regulating authorities* **OPTIONAL COST:** monitoring = 1200€ (equipment) + 1200€ (installation)+ 38 €/year (RESOL subscription) • Financial Package : 4 310 €/year for 10 years (in average) cf. Total - subsidies ; cash + financial loan (= duration + annuity) • Previsionnal cost = financial loan = 40 000€ Loan rate = **1,5%** (with yearly increase) / STE Durability = +30 years • Duration: **10 years** => 40 000€ / 10 years = 4 000€/year ; taking into account the loan rate: 4 310 €/year (in average) • Return on investment (global expense / annual savings): 7.6 years • Global expense = 40 000€ Annual energy savings = 5 237 € per year during 30 years so in total : 5 237 €/year x 30 years = 157 110 € ROI = 40 000 / 5 237 = 7.6 years • ROIC = 5 237 / 40 000 =13% Yearly Earnings (Annual savings and yearly loan payment): 927 €/year (for 10 years, then 5 237 €/year) cf. good if savings > loan Annual savings = 5 237 € • Yearly loan payment = 4 310 € • Difference = X1 - X2 = 5 237 - 4 310 = 927 €/year of earnings during the 10 year-loan period / after = 5 237 €/year 2 3 4 9 10 Year Costs without STE 11098 11653 12235 12847 13489 14164 14872 15615 4247 4247 4247 4247 4247 4247 Loan repayment 4247 Gas remaining to buy 6274 6588 6917 7263 7626 8008 8408 8828 10731 11268 11831 12422 14381 15100 15855 System maintenance Costs with STE 10521 10835 11164 11510 11873 12454 12861 13287 13735 14205 10970 11513 12084 12683 14666 15393 16157 Energy saving (1-5) €HT/Y 818 1071 1337 1616 1709 2011 2328 10770 11315 11886

• 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 environnment so few restrictions; when roof, request for work to municipality / when on the floor, nothing needed as long as within property



Energy saving €HT/m

68 89 111 135 142 168



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Ну	Hyp = 30% AIDS Previsionnal Cost (total - subsidies): 29 500€ cf. cost of equipment & installation + site preparation - potential aids = previsional cost 																				
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	 cf. Total - subsidies; cash + financial loan (= duration + annuity) Previsionnal cost = financial loan = 29 500 € Duration: 10 years / Loan rate = 1,5% (with yearly increase) / STE Durability = +30 years => 29 500 € / 10 years = 2 950 €/year; taking into account the loan rate: 3 179 €/year (in average) Return on investment (global expense / annual savings): 5.6 years Global expense = 29 500 € Annual energy savings = 5 237 € per year during 30 years so in total : 5 237 €/year x 30 years = 157 110 € ROI = X1 € / X2 € = 29 500 / 5 237 = 5.6 years ROIC = X2 € / X1 € = 5 237 / 29 500 = 17 % Yearly Earnings (Annual savings and yearly loan payment): 2 105 €/year (for 10 years, then 5237 €/year) cf. good if savings > loan Annual savings = 5 237 € Yearly Dan payment = 2 122 € 																				
	• Difference – 7	1 - 1	2 - 5 2	37 - 3	132-	2 10:	5 €/ye		earn 8		10	11 g the T	0 year-i	0an p	14	15	16	17 €/ yea	1 18	19	20
			-	5		5	0		0		10		10	20					10		20
1	Costs without STE	11098	11653	12235	12847	13489	14164	14872	15615	16396	17216	18077	18981	19930	20926	21973	23071	24225	25436	26708 28	8043
	Loop reportment	2170	2170	2170	2170	2170	2170	2170	2170	2170	2170	0	0	0	0	0	0	0	0	0	0
2	Gas remaining to buy	6274	6588	6917	7263	7626	8008	8408	8828	9270	9733	10220	10731	11268	11831	12422	13044	13696	14381	15100 15	855
4	System maintenance	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
5	Costs with STE	9453	9766	10096	10442	10805	11386	11793	12219	12667	13137	10452	10970	11513	12084	12683	13312	13973	14666	15393 16	5157
_		0	1996	0	0	0	0	0	0	0	0	7625	0	0	0	0	0750	0	10770	0	0
7	Energy saving (1-5) €HT/m	1045	1000	178	2405	2004	231	257	283	3729	340	635	668	701	737	774	813	854	898	943	991
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RELEVANT REMARKS & COMMENTS

#1: annonce un total de 2500m3 d'eau par an mais bien supérieur à une estimation de 2000 L privilégié ici