EiiF Presentation

TIPCHECK: an innovative European energy audit standard for industrial installations

eceee 2014 Industrial Summer Study on energy efficiency
Arnhem 2-5 June 2014

www.eiif.org

We Power Sustainability

European Industrial Insulation Foundation

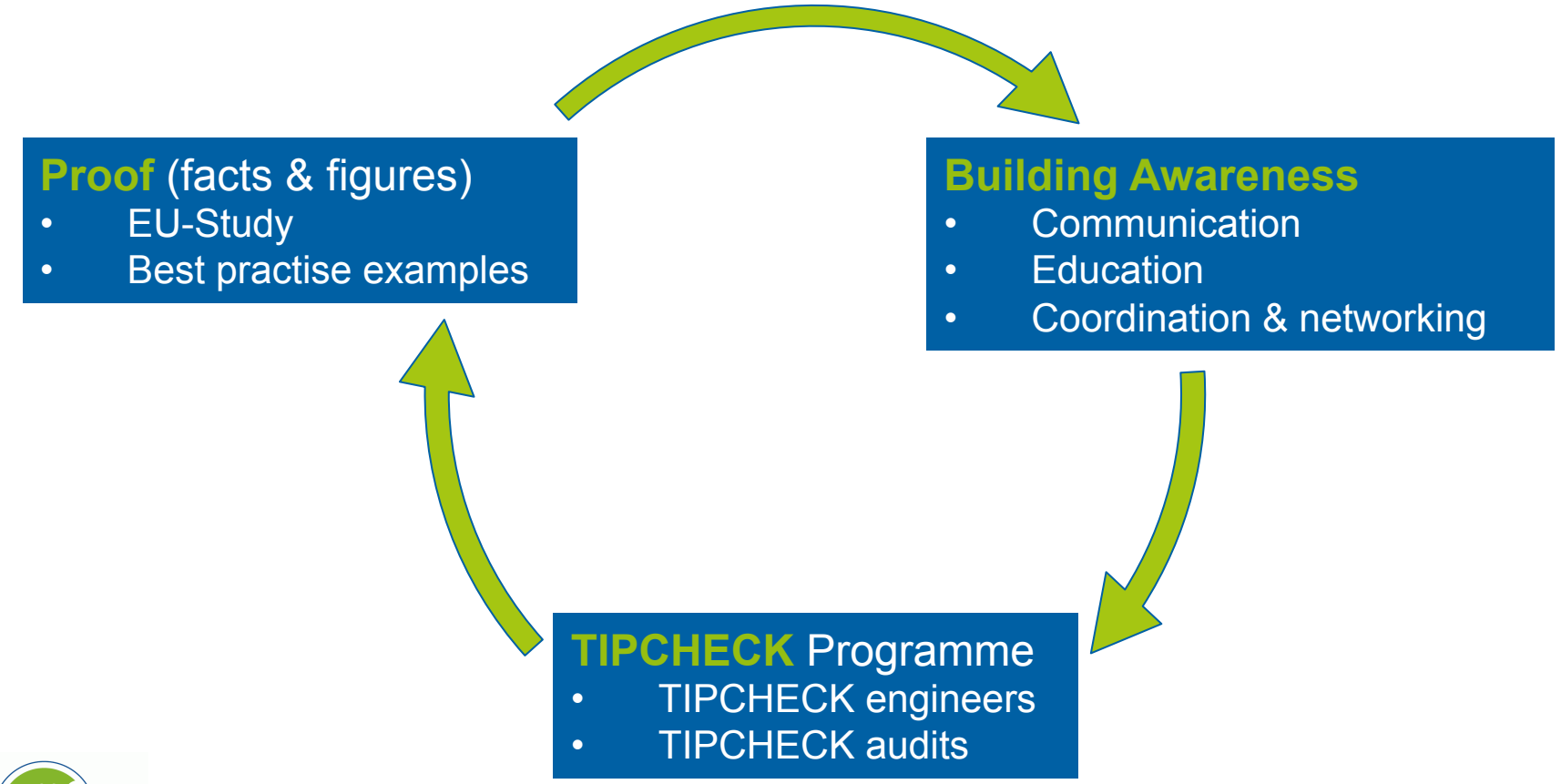
What is the EiiF?

- **>>** A **Foundation** established in 2009 and headquartered in Switzerland.
- **>>** As a **neutral** and **non-profit institution**, it promotes insulation as a top-of-mind method of enhancing sustainability and profitability.
- **>>** Its programme **raises awareness** of the growing, much needed **benefits of insulation** and is open for new members.

Article 2 Purpose of the Foundation

The Foundation engages itself throughout Europe, exclusively and irrevocably, on a non-profit basis for the deployment of sustainable insulation systems in industrial plants and in the industrial environment with the aim of saving energy, reducing CO2 emissions and realizing the best possible noise and fire control systems.

EiiF strategy to stop energy losses

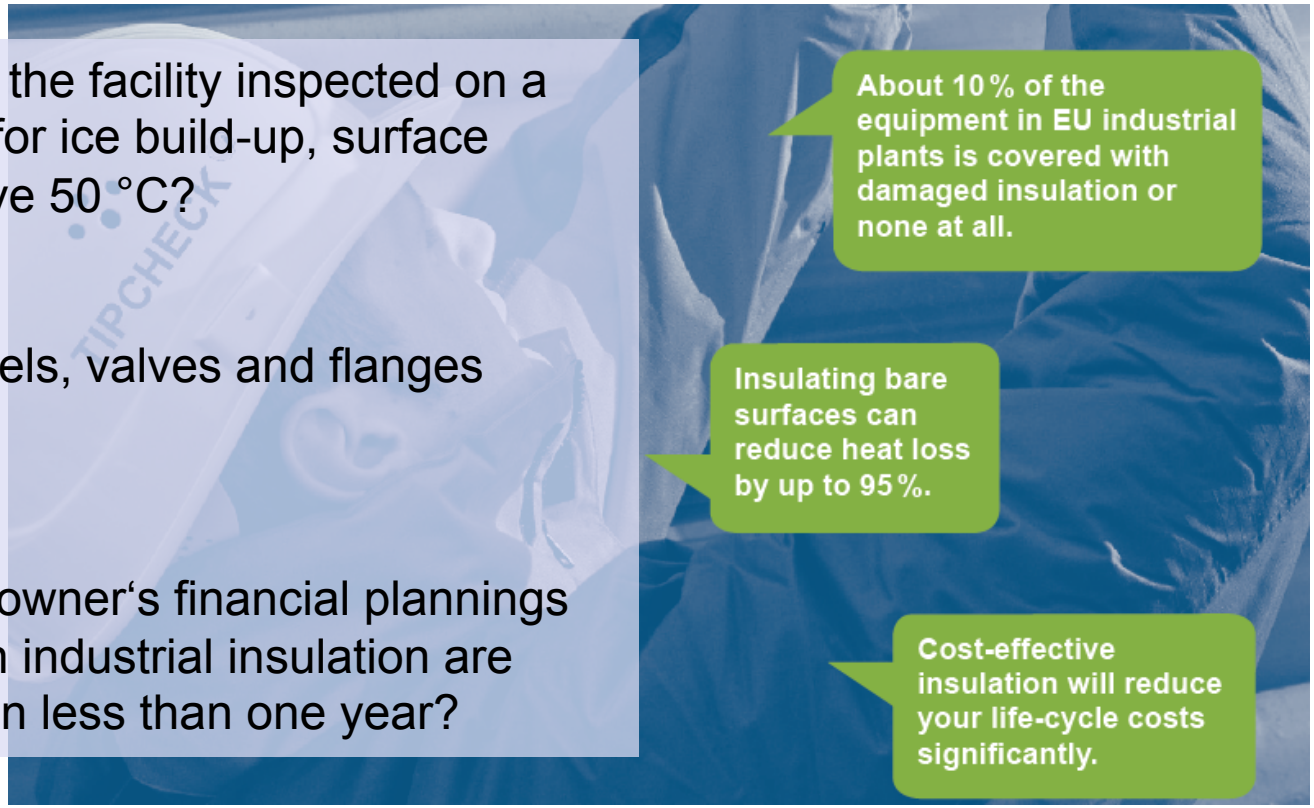


TIPCHECK Savings Potential

1. Is the insulation of the facility inspected on a regular basis e.g. for ice build-up, surface temperatures above 50 °C?

2. Are all pipes, vessels, valves and flanges insulated?

3. Is it considered in owner‘s financial plannings that investments in industrial insulation are usually paid back in less than one year?



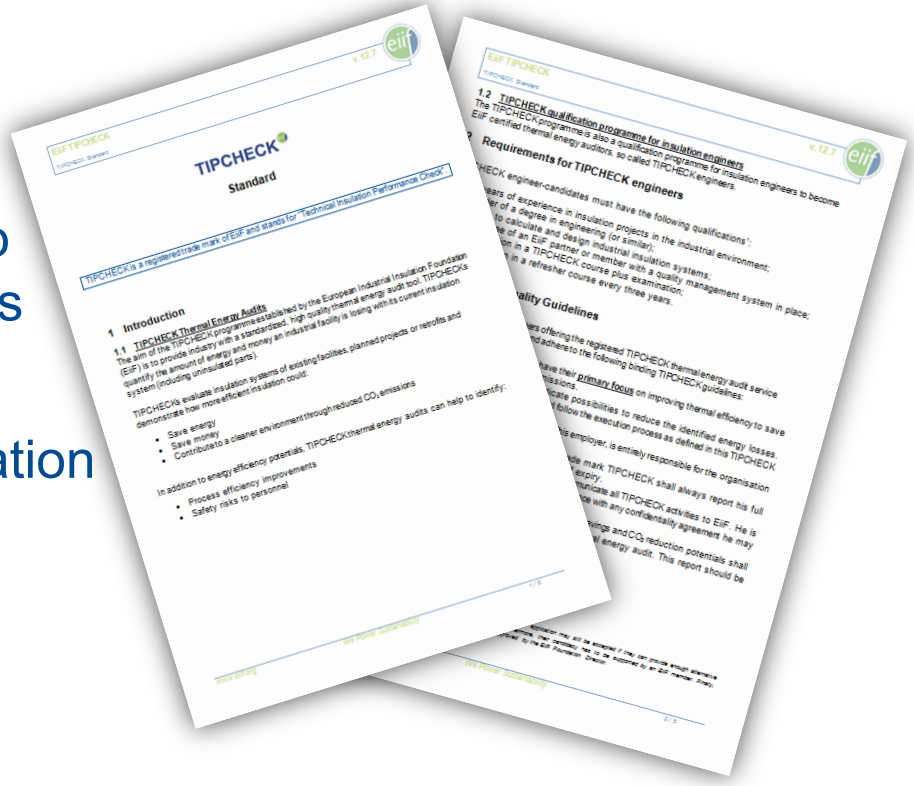
What is the TIPCHECK programme?

The TIPCHECK programme

The name **TIPCHECK** stands for **T**echnical **I**nsulation **P**erformance and **Check**

It's a:

- Standardized energy auditing **tool** to evaluate industrial insulation systems (standardized TIPCHECK audits)
- **Qualification programme** for Insulation engineers (certified TIPCHECK engineers) and (internal) energy auditors



The TIPCHECK Tool

- **TIPCHECK thermal energy audits** **evaluate** industrial insulation systems of existing facilities, planned projects or retrofits with the aim to improve the energy efficiency of industrial processes.
- **Quantify** the amount of energy and actual euros a facility is losing in its current configuration
- **Demonstrate** how more efficient insulation could:
  - ✓ Save energy
  - ✓ Save money
  - ✓ Contribute to a cleaner environment through reduced CO_2 emissions
- In addition, TIPCHECK thermal energy audits can help to **identify**:
  - ✓ Process efficiency improvements
  - ✓ Safety risks to personnel

Who can become a TIPCHECK engineer?

Requirements for TIPCHECK engineers

TIPCHECK engineer-candidates must have the following qualifications :

1. For employees of an EiiF member company with a quality management system in place;
   a) Holder of a **degree** in engineering (or similar);
   b) Different criteria for years of experience according to the certification level: TIPCHECK assistant, TIPCHECK engineer or Senior TIPCHECK engineers
   c) Ability to **calculate and design** industrial insulation systems;
   d) Participation in a **TIPCHECK course** plus examination;
   e) Participation in a **refresher course** every three years.
2. For end users, energy auditors, Escos, etc. (to be developed)

TIPCHECK course curriculum

Content:

- What is a TIPCHECK / the TIPCHECK Standard?
- Insulation Theory basics (EN ISO 12241 and EN ISO 23993)
- Energy auditing standards (EN 16247 Parts 1-5 and ISO FDIS 50002)
- Calculate Energy Savings
- Practical Experiences
- Training in Communication
- Multiple-Choice Test

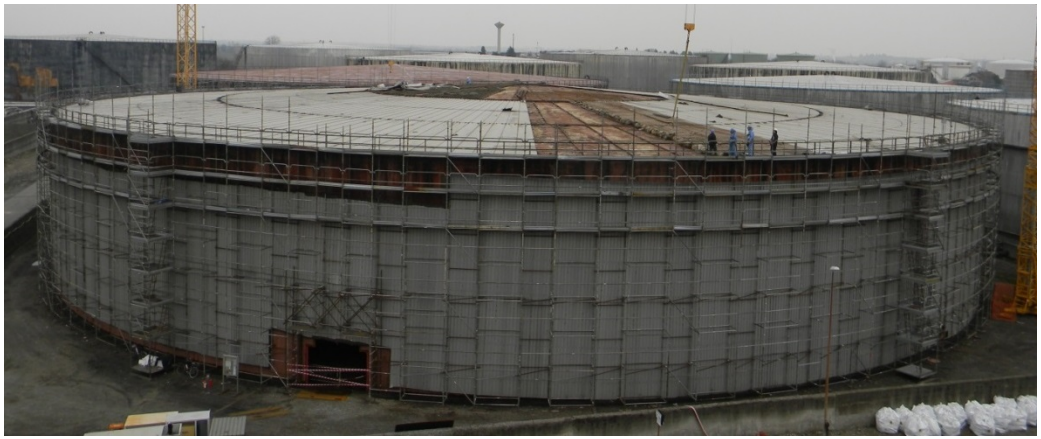
The Execution

1. **Acquisition, Sales and Technical Preparation**
   -> Define the TIPCHECK targets with the client:
2. **Facility Visit**
   -> Get an idea of the scope of the project to make the offer
3. **Executing the TIPCHECK**
   -> Analyse the insulation situation,
   -> **Measurement** and collection of all needed information
4. **Calculate the Savings Potential**
   -> TIPCHECK calculator
5. **Writing of the TIPCHECK report**
   -> Establish a detailed and tailor made report
6. **Presentation of the TIPCHECK report**
   -> Convince the client to improve the existing insulation situation

TIPCHECK examples

TIPCHECK example: Refinery tank roof

Refinery – Oil Storage tank roof (60 ºC Oper. Temp)

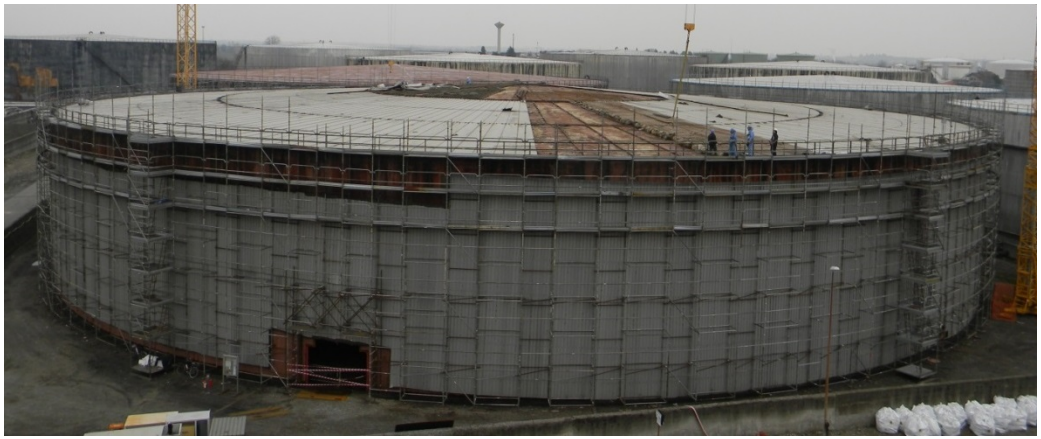


Key facts:

- Very old and damaged insulation was present on the roof
- Huge C.U.I. problems - sheets of the roof heavily corroded
- Need to demolish the old roof and to replace it
- The owner was planning to have the roof uninsulated

TIPCHECK example: Refinery tank roof

Refinery – Oil Storage tank roof
(60 ºC Oper. Temp)



Key findings:

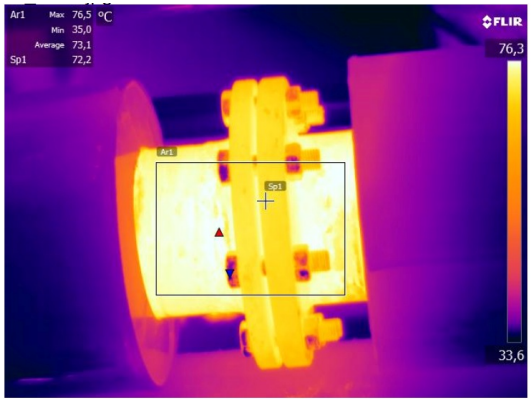
- **Without insulation** the energy loss would have been ~430.000 Euros/year (~9,500 MWh/year)

- An insulation of just **30 mm thickness** on the roof, applied with a technical solution which avoids future C.U.I. problems, reduces the energy loss by 80% and has a payback time of 15 months.

TIPCHECK example: Chemical Plant

Key facts:

- Flanges and valves not insulated
- Old and damaged insulation partly in place.
- Need to evaluate the saving potential connected with the insulation of un-insulated parts and with the recovery of efficiency of old and damaged insulation



TIPCHECK example: Chemical Plant

Execution of the Tipcheck:

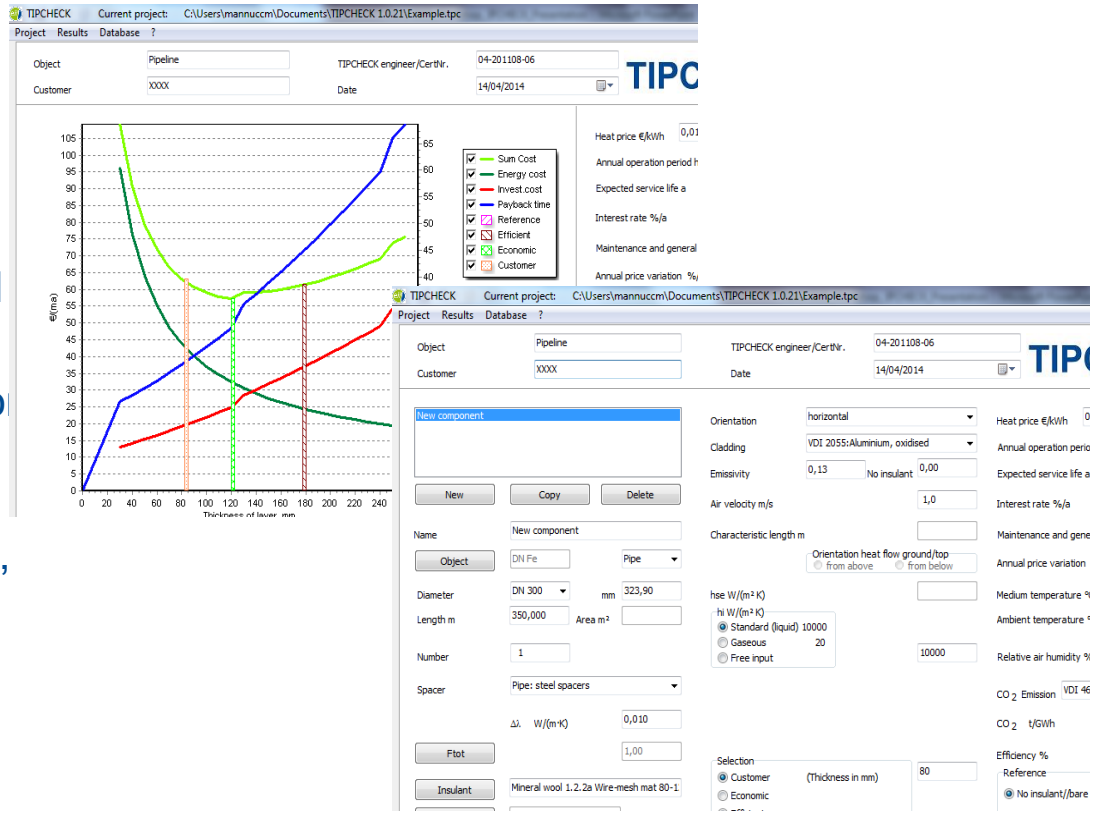
- Definition of the scope: to define the pipelines, vessels and tanks to be included in the audit

- On-field measurement campaign, gathering environmental data, surface temperatures and thermal images.

TIPCHECK example: Chemical Plant

Execution of the Tipcheck:

- Definition of the scope: pipelines, vessels and tanks to be included in the audit
- On-field measurement campaign, gathering environmental data, surface temperatures and thermal images.
- Gathering of all relevant calculatio input data from the Customer (energy cost, operating hours, expected service life, interest rate, etc).
- In-office calculation job, using the "TIPCHECK calculator" software.



TIPCHECK example: Chemical Plant

Summary of the results:

TIPCHECK engineer:
Michele Mannucci; Matteo Bagnoli

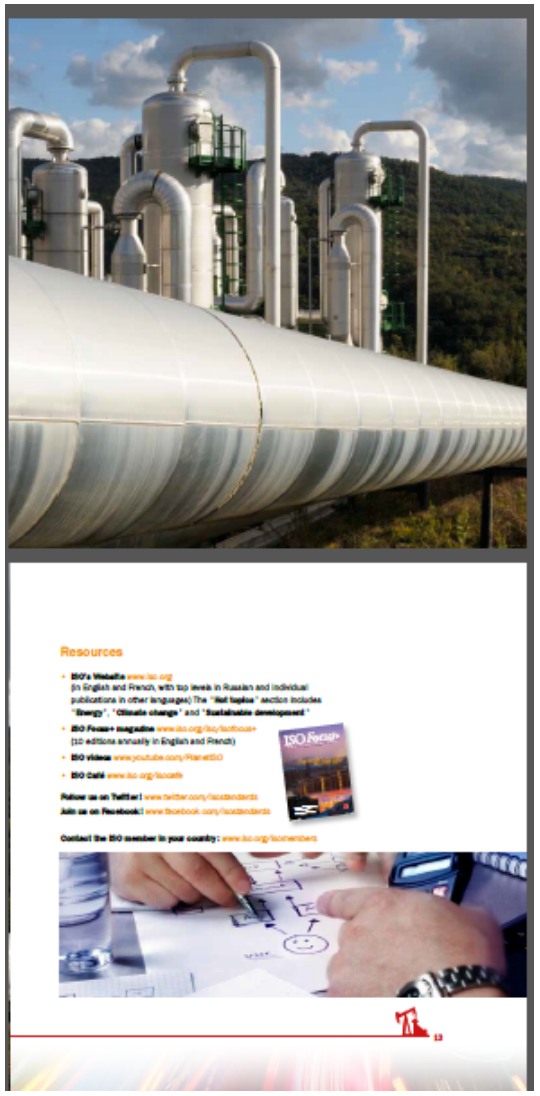
TIPCHECK XXXX

Date: 29 - 08 - 2013

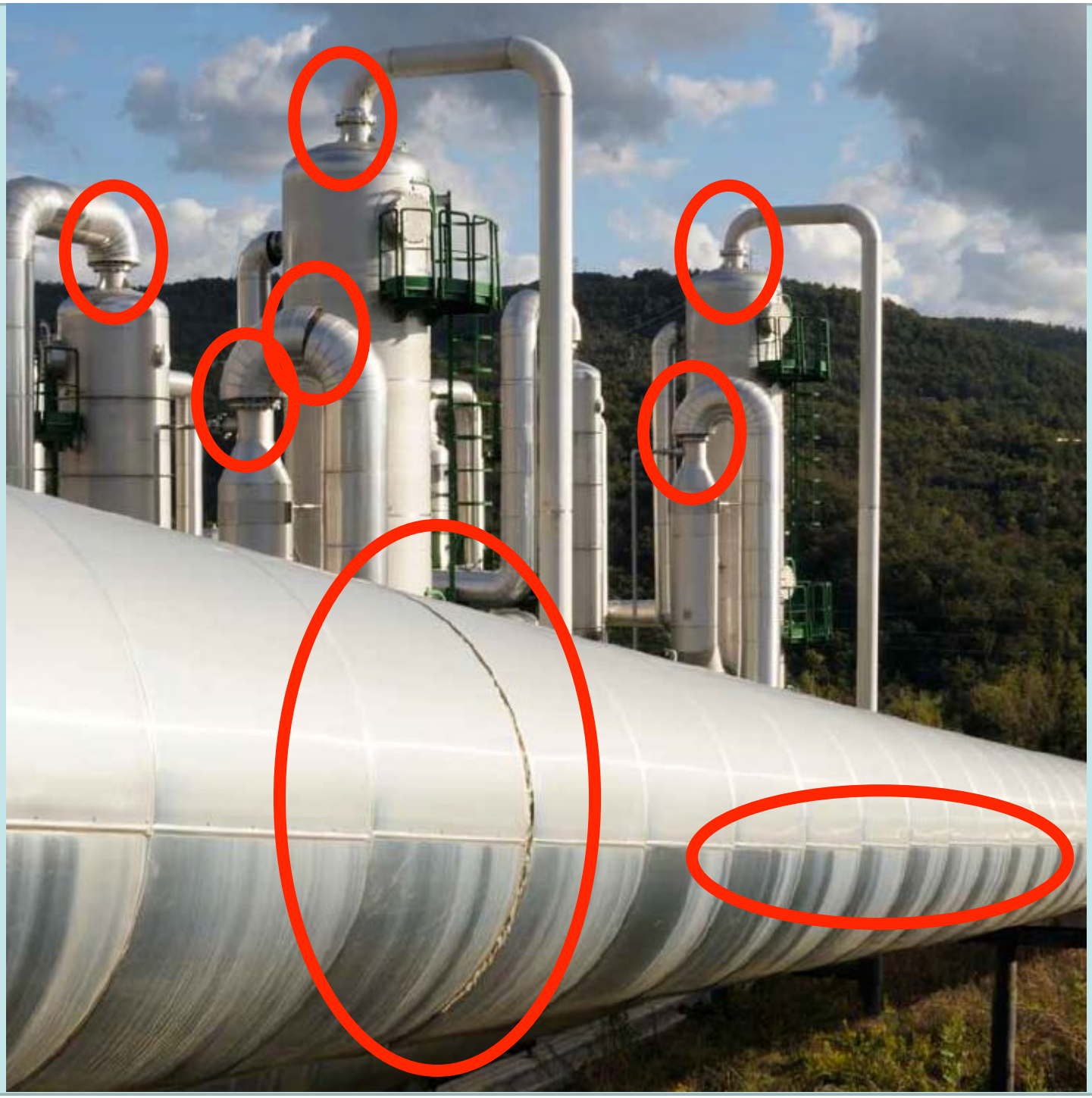
TIPCHECK

Operating costs [€/kWh]	0,0180
f- Coeff. di variaz. annua prezzo energia	1,1016
Vita prevista [anni]	10

	Item	coibente	ore operative	dispersione prima dell'investimento [W]	dispersione dopo l'investimento [W]	differenza [W]	energia risparmiata [GJ]	costi di installazione [€]	risparmio annuo [€/anno]	risparmio totale [€/vita utile]	tempo di ritorno (mesi)	spessore esistente (mm)	spessore economico (mm)	CO_2 risparmiata (t/anno)
4.1	Linea da DS a apparecchio "CB" - CaCl2	Lana R.	8.400	225.769,00	14.435,00	211.334,00	6.390,74	17.342,81	31.953,70	319.537,01	6,5	0/100	70	358,59
4.2	Linea da "CB" a "DC CO3"	Lana R.	8.400	1.964,00	138,00	1.826,00	55,22	257,65	276,09	2.760,91	11,2	0	90	3,10
4.3	Riserva "DC CO3"	Lana R.	8.400	141.644,00	7.048,00	134.596,00	4.070,18	11.607,45	20.350,92	203.509,15	6,8	0	70	228,38
4.4	Linea da riserva "DC CO3" a riserva "LEP"	Lana R.	8.400	1.547,00	113,00	1.434,00	43,36	219,60	216,82	2.168,21	12,2	0	90	2,43
4.5	Riserva "LEP"	Lana R.	8.400	147.335,00	7.287,00	140.048,00	4.235,05	11.607,45	21.175,26	211.752,58	6,6	0	70	237,63
4.6	Linea da riserva "LEP" a "RH" (LEP → pompe)	Lana R.	8.400	10.128,00	782,00	9.346,00	282,62	923,00	1.413,12	14.131,15	7,8	0	70	15,86
	Linea da riserva "LEP" a "RH" (pompe → RH)	Lana R.	8.400	51.449,00	2.234,00	49.215,00	1.488,26	2.567,71	7.441,31	74.413,08	4,1	80	50	83,51
4.7	Linee presso gli "RH"	Lana R.	8.400	163.766,00	4.155,00	159.611,00	4.826,64	3.466,17	24.133,18	241.331,83	1,7	0	70	270,83
4.8	Linea da "RH" a "CRG1"	Lana R.	8.400	22.196,00	1.852,00	20.344,00	615,20	1.646,25	3.076,01	30.760,13	6,4	0	70	34,52
4.9	Linea da "RH" a "CRG2"	Lana R.	8.400	5.894,00	662,00	5.232,00	158,22	514,24	791,08	7.910,78	7,8	70	70	8,88
	Linea da "RH" a "CRG2"	Pyrogel	**8.400**	**8.009,00**	**1.131,00**	**6.878,00**	**207,99**	**1.403,72**	**1.039,95**	**10.399,54**	**16,2**	**10**	**20**	**11,67**
4.10	Linee da "E3101" a pompe presso "CRG 1 e 2"	Lana R.	8.400	79.440,00	2.598,00	76.842,00	2.323,70	1.574,62	11.618,51	116.185,10	1,6	90	100	130,39
	Linee da "E3101" a pompe presso "CRG 1 e 2"	Pyrogel	**8.400**	**3.913,00**	**293,00**	**3.620,00**	**109,47**	**317,45**	**547,34**	**5.473,44**	**7,0**	**10**	**20**	**6,14**
	Linee da "E3101" a "CRG 1" (pompe → CRG1)	Lana R.	8.400	22.445,00	1.278,00	21.167,00	640,09	977,19	3.200,45	32.004,50	3,7	0	70	35,92
	Linee da "E3101" a "CRG 1" (pompe → CRG2)	Lana R.	8.400	22.467,00	1.557,00	20.910,00	632,32	1.020,68	3.161,59	31.615,92	3,9	70	100	35,48
4.11	**Linea da "CRG1" a "E3101"**	Pyrogel	**8.400**	**109.089,00**	**2.822,00**	**106.267,00**	**3.213,51**	**3.770,09**	**16.067,57**	**160.675,70**	**2,8**	**10**	**20**	**180,31**
4.12	Linea da "CRG2" a "E3101"	Lana R.	8.400	10.942,00	442,00	10.500,00	317,52	397,59	1.587,60	15.876,00	3,0	70	90	17,82
4.13	Linea di ingresso e uscita dell' "E3101"	Lana R.	8.400	29.594,00	1.369,00	28.225,00	853,52	550,70	4.267,62	42.676,20	1,5	80	110	47,89
4.14	Linea di collegamento tra "E3101" e "E3010 1, 2, 3, 4"	Lana R.	8.400	102.456,00	5.026,00	97.430,00	2.946,28	2.267,42	14.731,42	147.314,16	1,8	150	150	165,32
4.15	Linea di collegamento tra "E3101" e "E3102 - 3, 4"	Lana R.	8.400	36.941,00	2.678,00	34.263,00	1.036,11	1.905,17	5.180,57	51.805,66	4,4	80	100	58,14
4.16	**Linee tra "E3102 - 3, 4" e "DT-BP 1 e 2" (uscita da E3102)**	Pyrogel	**8.400**	**1.546,00**	**308,00**	**1.238,00**	**37,44**	**311,57**	**187,19**	**1.871,86**	**20,0**	**10**	**20**	**2,10**
	Linee tra "E3102 - 3, 4" e "DT-BP 1 e 2" (uscita da E3103)	Pyrogel	**8.400**	**2.732,00**	**531,00**	**2.201,00**	**66,56**	**542,98**	**332,79**	**3.327,91**	**19,6**	**20**	**20**	**3,73**
	Linee tra "E3102 - 3, 4" e "DT-BP 1 e 2" (uscita da E3104)	Lana R.	8.400	2.842,00	251,00	2.591,00	78,35	195,86	391,76	3.917,59	6,0	0	70	4,40
	Linee tra "E3102 - 3, 4" e "DT-BP 1 e 2" (collettore)	Pyrogel	**8.400**	**12.436,00**	**1.706,00**	**10.730,00**	**324,48**	**2.123,99**	**1.622,38**	**16.223,76**	**15,7**	**10**	**20**	**18,21**
	Linee tra "E3102 - 3, 4" e "DT-BP 1 e 2" (linee ingresso "DT-BP")	Lana R.	8.400	20.660,00	1.834,00	18.826,00	569,30	956,11	2.846,49	28.464,91	4,0	0	70	31,94
4.17	Linea tra "DT-BP 1 e 2 " e riserva "DC-DE" (DT → pompe)	Lana R.	8.400	2.108,00	223,00	1.885,00	57,00	330,58	285,01	2.850,12	13,9	0	70	3,20
	Linea tra "DT-BP 1 e 2 " e riserva "DC-DE" (pompe → "DC-DE")	Lana R.	8.400	4.608,00	512,00	4.096,00	123,86	399,65	619,32	6.193,15	7,7	0	40	6,95
4.18	Riserva "DC-DE"	Lana R.	8.400	41.771,00	1.547,00	40.224,00	1.216,37	6.040,43	6.081,87	60.818,69	11,9	0	100	68,25
4.19	Linee da riserva "DC-DE" a riserva "40%"	Lana R.	8.400	2.112,00	252,00	1.860,00	56,25	447,31	281,23	2.812,32	19,1	0	50	3,16
4.20	Riserva "40%"	Lana R.	8.400	42.689,00	1.576,00	41.113,00	1.243,26	6.040,43	6.216,29	62.162,86	11,7	0	100	69,76
4.21	Linee da riserva "40%" a "EVCC"	Lana R.	8.400	1.726,00	326,00	1.400,00	42,34	355,99	211,68	2.116,80	20,2	70	40	2,38
4.22	Linea da "EVCC" a riserva "DC 7"	Lana R.	8.400	7.078,00	1.119,00	5.959,00	180,20	1.067,97	901,00	9.010,01	14,2	50	40	10,11
4.23	Linea da riserva "DC 7" a "RH 1 e 2" (DC7 → pompe)	Lana R.	8.400	980,00	243,00	737,00	22,29	193,58	111,43	1.114,34	20,8	50	30	1,25
	Linea da riserva "DC 7" a "RH 1 e 2" (pompe → RH1)	Lana R.	8.400	421,00	121,00	300,00	9,07	219,29	45,36	453,60	58,0	60	30	0,51
	Linea da riserva "DC 7" a "RH 1 e 2" (pompe → RH2)	Lana R.	8.400	325,00	78,00	247,00	7,47	170,12	37,35	373,46	54,7	50	30	0,42
4.24	Linea di alimentazione	Lana R.	8.400	51.074,00	1.400,00	49.674,00	1.502,14	775,44	7.510,71	75.107,09	1,2	0	110	84,29
				1.392.096,00	**69.927,00**	**1.322.169,00**	**39.982,39**	**84.508,26**	**199.911,95**	**1.999.119,53**	**5,07**	-	-	**2.243,46**



http://www.iso.org/iso/iso_50001_energy.pdf



TIPCHECK example: Chemical Plant, France

Key facts:

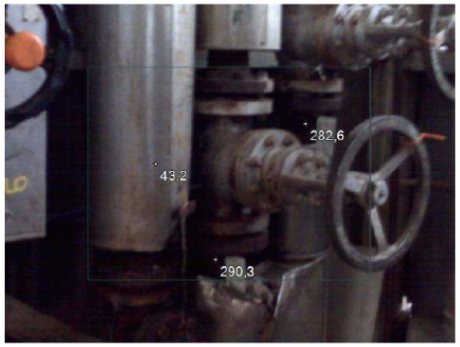
- 1 employee equiped with a thermografic camera
- 2 weeks on-site
- 400 pictures taken and used for the audit report

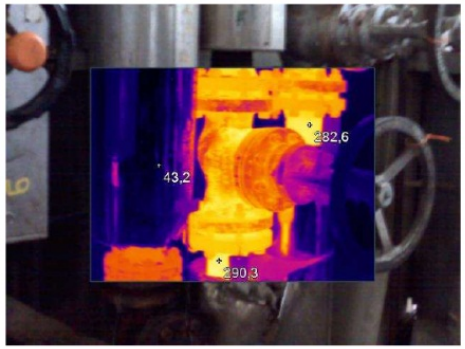
Key findings:

- Safety: Burn risk due to missing insulation
- Financial: Money savings due to reduced energy loss
- Energy Efficiency: Energy/heat loss

TIPCHECK example: Chemical Plant, France

Key findings - **Safety**





Non-insulated parts of equipment:

Detected burn danger:

Surface temperatures above 280°C bare a great risk of severe burn injuries for staff

Proposed insulation solution:

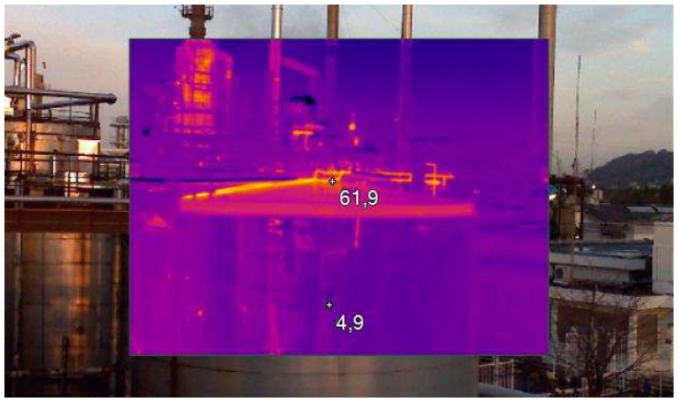
Installment of mattress insulation to assure surface temperatures below 50°C

Action:

About 30 similar valves were identified and insulated

TIPCHECK example: Chemical Plant, France

Key findings – **Energy Efficiency**



1. Storage tanks

35 Storage tanks with uninsulated roof tops

Surface approx.	28m^2
Temperature of stored liquids:	150˚C
Unnecessary energy loss per year	**approx. 12.000 MWh**

2. Valves

30 Uninsulated valves (see Safety):

Internal temperature:	approx. 300 °C
Unnecessary energy loss per year	**approx. 600 MWh**

TIPCHECK example: Chemical Plant, France

Key findings – **Financial**

Savings potential:

Total unnecessary annual energy loss (valves+tanks):	**approx. 12.600 MWh**
Total annual financial saving potential (4ct/kWh):	**approx. 505.000 EUR**

Investment:

TIPCHECK:	approx. 10.000 EUR
Insulation instalment and material costs:	approx. 90.000 EUR
Total investment:	**approx. 100.000 EUR**

Payback time: **approx. 2,4 months**

TIPCHECK example: Refinery, Italy

Refinery in Italy

Doubling the insulation thickness and using better material **cut the heat losses in half**.

Energy Savings: **1.021.958 kWh/a**

Financial Savings: **75.000,00 EUR**

Payback time: **1-3 years***

*The new insulation system had to improve the fire protection, which lead to more expensive materials than those that would have been used for energy efficiency only. This higher investement extended the payback in this example from 1 to 3 years.

TIPCHECK example: Processing plant, Germany

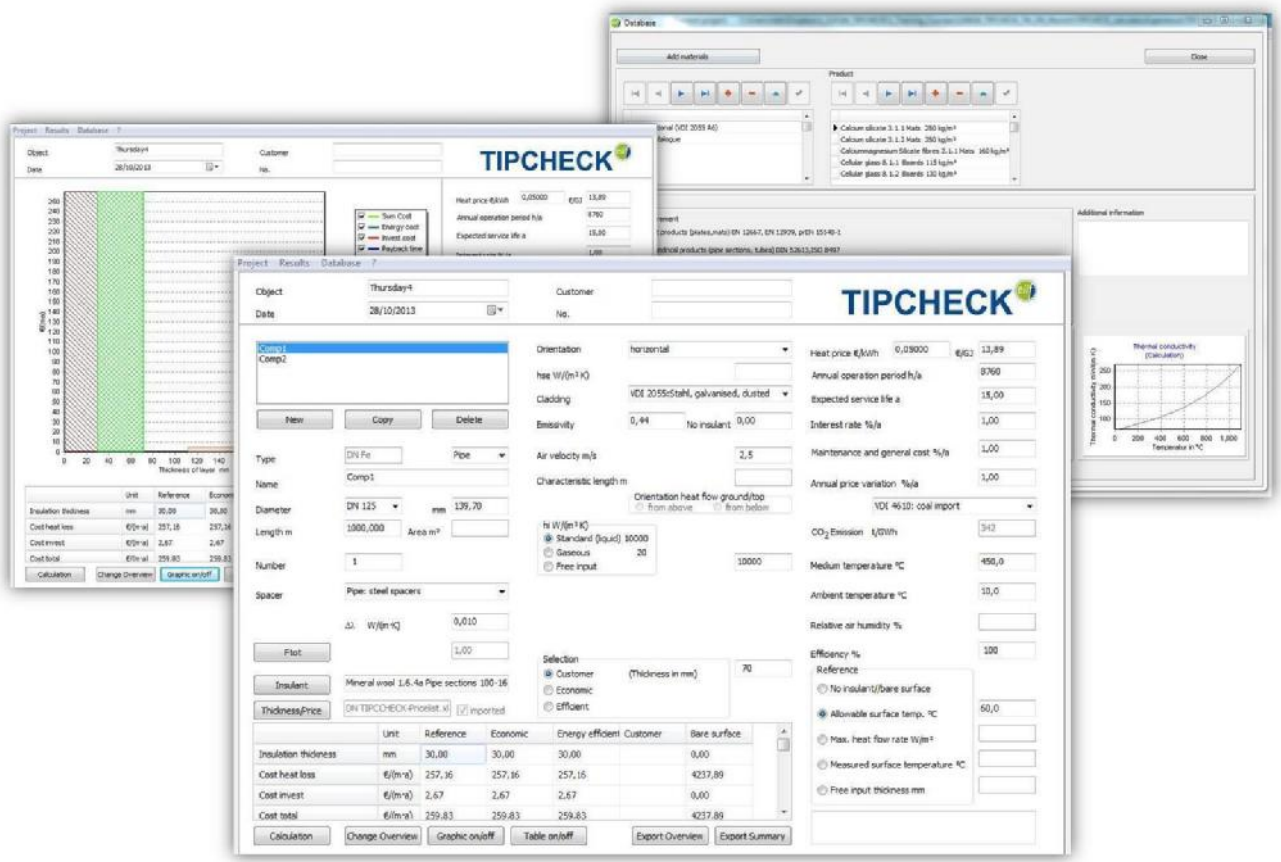
Insulation of an asphalt boiler in Germany

- Tube, ferritic steel, thickness: 5 mm
- Width 1,70 m
- Depth 0,760 m
- Hight 26 m
- Surface 127,92 m^2
- Average heatprice 0,033 €/kWh
- Operating hours: 1‘500

- **Insulation investment 12.792 EUR**
- **Energy savings 1.450 MWh/a**
- **Financial savings 47.800 EUR/a**
- **Payback time < 3 months**

TIPCHECK calculator software

TIPCHECK calculator



Thank you!

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