IEE/12/758/SI2.644752

D 6.2: Audit and training proposal Report (English)

Software for tool kit



Transfering Energy Save Laid on Agroindustry

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Update version:

September 2013

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About this report

This report has been develop in the framework of the TESLA project (Intelligent Energy in Europe) and has been founded by the European Commission.

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1. Introduction

The aim of this task is to check, according to the feedback from previous Deliverable 6.1 and some findings about tools developed by some companies involved in energy efficiency issues, how these software and tools could be used in TESLA auditing activities. All the conclusions will be incorporated in this report D 6.2 Audit and training proposal report.

2. Target

Target group of this document are auditors who attendance to TESLA training course and who will do 110 energy audits in cooperatives of TESLA project.

3. Methodology

To reach this purpose several previous tools to be used in auditing phase were analyzed and checked and as a result this guide has been elaborated to show how these tools can be applied in TESLA audits and what main results they offer. Previous tools analyzed are the following:

PINE: Tool analyzes both thermal and electric devices like lighting, boilers, cooling, engine, fan, compressed air, furnace, heating. As a result a report with suggestion and advices to implement in the installation is shown together with a Sankey diagram with the information of the energy consumes. This tool is very useful to check what energy efficiency state of cooperatives are and to show what is the distribution of energy flows.

ABB Pump save: Tool analyze the possibility to install a speed driver in engines installed in pumping process, analyzing what is the charge profile and the current engine power. As a result a graph comparing previous scenario and energy efficiency scenario is shown. The tool is very useful to analyze possibility to install frequency drivers in processes.

Eco8: It is a tool develops by Schneider electric in with is study the possibility to install a speed driver in engines installed both in fan like in pump applications. As a result payback time and energy saving are given. The tool is very useful to analyze possibility to install frequency drivers in processes.

PEP: This tool is directed to improve performance in combined heat and power production, compressed air, electrochemical processes, fans and blowers, industrial facilities (lighting, HVAC). As results are given: potential annual CO₂ saving from electricity, fuel and steam, a suggestion short text with the measures that should be implemented, graph with potential annual energy savings by process, and annual energy use, classify by energy type and cost.





Aislam: This tool is directed to improve the isolation devices: in flat plates, pipes, sphere and special applications. As a result final pipe temperature, thermal resistance, and thermal flow are given.

4. PINE

4.1. Tool description

Available in: http://circe2.deweb.es/herramienta/index.php

Every file or company data is kept and accessible by means of a username and password. If you want to access an existing file for a given cooperative in case you want to recover one diagnosis, please insert the login and password corresponding to the company. If you want to create a new file, click on "Press here to proceed to the energy audit questionnaire". To access the tool main screen there are two options:

- 1- Insert login and password should you be a registered user.
- 2- If not a registered user, you must click "here" and register for the first time to access the computer questionnaire tool.

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Figure 1: Mode in the tool

The questionnaire relating to the diagnosis tool, characterization and improvement of energy efficiency includes two types of questions: Company data and issues specific to the equipment installed in the company, their characteristics and mode of operation, well as the overall operation of





the facility. The first screen after registering the generic data corresponding to the company, is as shows Figure 2.

At the end of the generic data questionnaire you will be requested to provide a username and a password for this particular company. If any of the compulsory data fields are empty or wrong they will be marked in red after pressing "continue"

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Figure 2: Screen details

To continue the questionnaire and move on to the following screen, at least the mandatory fields marked with an asterisk (*), must be completed then click on "Continue". Once the general data screen for the company, the different blocks in which the questions are divided for the sector of activity (NACE) - *in case of TESLA, all agro industrial activities are included and several specific NACE code for agroindustry cooperatives are available*- to which your cooperative belongs start:

- Technical data
- Boilers
- Cooling devices
- Engines, fans, pumps, compressors
- Furnaces.

On the left of the screen you will be informed about the module of information you are in. On the right top corner the company name and the log out button will be displayed. The first screen requests the amount of production per year in m², litres, tonnes or kg, as well as a free text box for additional explanations about the type of product. One or more types can be filled in.





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Technical data	What final amount of product is produced by your company?	
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Furnaces	100000 Litres	litres of alchoholic drinks
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	Example filling in question :	
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	7 INTELLIGENT ENERGY	
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Figure 3: Screen details for production volume.

It shown in Figure 3, the various modules into which the screen is divided completion of the questions. The structure of all blocks independently is similar:

1- <u>Modules of the tool:</u> It left the area in which the block is to be completed over the computer tool.

We can observe that there are two symbols:

- Solution is a set of the set of t
- Indicates that the block has been completed and completed correctly.
- 2- Company name and log out button the tool: at the top right. It displays the name of the company that is conducting the survey Besides, you have the option "log out", which allows you to quit the tool to continue from that point later.
- 3- **Form:** It is the main module of the screen, since it shows the questions, answer choices and aids for completing them.





4- Back to the previous form: This option, located at the bottom left, drives you back to previous screens on error in filling in the data. Once you get back the necessary screens, it is again necessary to complete the questionnaire from the point at which the tool is at that time. The reason is because whatever changes made in the entered information may entail a path change in the decision tree.

In each of the forms, by continuing, any required information is missing, this will be marked in red as shown in Figure 4.

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Figure 4: Image display incomplete data

At the end of each module a message communicates that you have successfully completed the module and indicates what will be the next module to appear. Some questions may not be clear. If a blue o , appears, you can click for further details and explanations as the example below. Some questions are simply yes / no questions as in the example below. A default value will be proposed.





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Figure 5: Yes / No questions

Some questions may not be clear. If a blue \heartsuit , appears, you can click for further details and explanations as the example below.



Figure 6: Help for a question





Every section starts by asking for the number of devices of each kind. You will be prompted to fill in a data sheet per each of the devices. If the company has several equal such devices you can fill in one, and copy the data for the following equipment, selecting it from the right column.

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Technical data			
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Furnaces	pump 102	<u>Fill in</u>	uncompleted
	compressor 103	Fill in	uncompleted
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The sole resp	onsibility for the content of this software lies with the authors. It does not nec The European Commission is not responsible for any use that may be ma	essarily reflect the opinion of the Europe de of the information contained therein.	an Communities.

Figure 7: List of devices to be described.

Once inside the questionnaire, you will be requested to fill in the device characteristics depending on the device you are describing. An important data will the loading factor, from 0 to 1. If unknown the real value a 0.75 default value will be assigned.

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 Cooling devices Engines, fans, pumps, compressors 	Engine name (less than 50 characters)	Other engines - copy data
Furnaces	Name fan 1	There are no equivalent engines to coevidata from
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	6.7 CV	
	What is the number of working hours per year?	
	528000 working hours/year	
	What is the engine's loading factor? 🔮	
	(value between 0 and 1)	
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Figure 8: Sheet for device technical data.





4.2. PINE Report

Once you have completed all phases of the software tool, you enter the final report proposed measures for the company in question. The report is divided into several blocks, which are detailed below.

First, there is a first block which general data of the company have been made to the tool.

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Industrial Sector: Machinery and mechar	ical equipment manufacturing		
Working hours per day: 10.0	Working days per year: 255		
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Figure 9: Image general report data

Next, the report shows a pie chart showing the share of the existing cooperative consumption by type of equipment. This diagram only shows consumer distribution outputs, if you want to also represent inputs, then you should open an energy Sankey diagram of the company in which both aspects are represented, for that purpose click on "View". This diagram will be added at the end of the report pdf version.







Figure 10: Company energy outputs diagram



Figure 11: Sankey Diagram

The next block in the report shows the general measures (without quantification) proposed to improve the energy performance of the company. For each of the measures the corresponding device described by the given name will be displayed in brackets.







Figure 12: General recommendations for energy improvement

Following, there is a general measures block with those measures by type of energy that it is possible to quantify.

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	affect the device performance Therefore compressors are de	signed to work at the top pressure level, which	ch is most likely not needed
	in winter. If the pressure switch settings are not changed, the eq	uipment would be operating at summer wors	st case conditions, thus
	loosing efficiency for winter working conditions. There are pote	ntial saving of 2% with respect to initial equip	pment consumption
		Saving:	4200 y 4800 kWh/year
2	[ENGINE REPLACEMENT BY A HIGH EFFICIENCY ONE.		
	For heavily used engines (more than 15 hours/day) older than 1	0 years it is strongly recommended to replace	ce conventional technology
	engines by high efficiency ones, saving up to 40% with respect	to the initial engine consumption. High efficie	ency engines provide the
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3	[INSTALL VARIABLE SPEED DRIVES FOR ENGINES □ > □4 k	W THAT WORK AT ARIABLE LOADS.	
	For engines submitted to variable loads, it is interesting to be ab	ble to modify the engine speed to adapt the p	oower to each moment's
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Figure 13: Energy improvements report, quantified measures

As seen in Figure 13, the savings are quantified using a range of values. Below is an overview of the initial situation of the company, shown by a red bar, and the consumption after the implementation of the measures proposed in the diagnostic report shown by a green bar.





Figure 14 shows the energy consumption by type showing the initial and the final consumption estimations. Please bear in mind that this is an average estimation of the savings achieved only by the full deployment of the quantitative recommendations. If the generic recommendations were implemented as well, the savings would be larger, although impossible to estimate.

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Figure 14: Picture showing the initial and final company consumption estimation

To summarize the actions proposed and the expected estimated impact a final summary table is provided, first showing generic qualitative measures and the associated equipment, and then, showing the quantitative measures and the amount and range of savings by type of energy as shown below.





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Audit	t result: generic meas	sures by equipment	
/ tuui	rresult. generie meat		
N٥	Equipment	Recommendation	Saving
1		REPLACEMENT OF INCANDESCENT BULBS BY LOW CONSUMPTION LAMPS.	Not quantifiable
2		CONSIDER THE USE OF LED TECHNOLOGY LAMPS.	Not quantifiable
3		INSTALL ELECTRONIC BALLAST PRIMERS FOR THE DISCHARGE LAMPS.	Not quantifiable
4		SET A LIGHTINGPREVENTIVE MAINTENANCE PLAN.	Not quantifiable
5	boiler 1	PERFORM REGULAR EQUIPMENT CHECKS AND PREVENTIVE MAINTENANCE	Not quantifiable
6	boiler 1	FIND OUT THE PROCESS AND THE BOILER EXHAUST GAS TEMPERATURE TO FINE-TUNE THE COMBUSTION PROCESS.	Not quantifiable
7	boiler 1	FIND OUT THE PROCESS AND THE BOILER EXHAUST GAS TEMPERATURE TO FINE-TUNE THE COMBUSTION PROCESS.	Not quantifiable
8		GENERAL RECOMMENDATIONS	Not quantifiable
9	Freezer 1	PERFORM REGULAR EQUIPMENT CHECKS AND PREVENTIVE MAINTENANCE	Not quantifiable
10	Freezer 1	DEFROST PERIODICALLY	Not quantifiable
11		GENERAL RECOMMENDATIONS	Not quantifiable
12	furnace 1	MEASURE THE FURNACE EXHAUST GAS TEMPERATURE TO OPTIMIZE IT	Not quantifiable
Audi	t result: specific meas	sures by equipment	

Figure 15: Summary table with the generic recommendations and the associated equipment

7.0	ngtoriai marcauores nerraili	епідая нущов	Laur
anda - '	Yah 🗵 🏹 Google Translate	🛛 🛛 🕹 🕹 🕹 🕹 🕹 🖓 Free Online Document Tra 🛛 🖁 Utimas noticias de Aragón 🗡 😳 Documento sin	titulo × pdf2tcpdf.pf
eweb.e	s/herramienta/2/pdf2tcpdf.php	습 マ C 🚼	▼ Google
] Con	menzar a usar Firef 🛄 Corporal	te Sustainabili 📋 Galería de Web Slice 📋 Hotmail gratuito 🌇 Moodle de la Universid 📋 Sitios sugeridos 🔛 Softonic - Programa d	🗌 Softonic - Últimas nov
			0500 44000
1		INSULATE PROPERLY THE HEAT DISTRIBUTION NETWORK TO MINIMIZE LOSSES.	kWh/year
2	Ahorro en	INSTALL A CONDENSED WATER HEAT RECOVERY SYSTEM TO SAVE ENERGY AND	28000 y 32000
	condensados	WATER.	kWh/year
		Total saving:	38000 y
			43000kWh/year
			1
1	Freezer 1	SET THE EQUIPMENT PRESSURE SWITCH ACCORDING TO THE YEAR SEASON	4200 y 4800
		(WINTER / SUMMER)	kWh/year
2		ENGINE REPLACEMENT BY A HIGH EFFICIENCY ONE.	19000 y 22000
			kWh/year
3		INSTALL VARIABLE SPEED DRIVES FOR ENGINES > 4 kW THAT WORK AT	57000 y 64000
		VARIABLE LOADS.	kWh/year
		Total saving:	80000 y
			90000kWh/year
1	boiler 1	apply corrective actions to reach the recommended combustion parameters when checking	9400 y 11000
		the boiler performance.	kWh/year
2	boiler 1	REVISE THE EXTERNAL BOILER INSULATION AND CREFRACTORY MATERIAL	2800 y 3300
			kWh/year
		Total saving:	12000 y
			14000kWh/year
			1
		Thermal savings percentage	5 y 7 %
		Electric savings percentage	7 y 9 %

Figure 16: Summary table with the quantitative recommendations and the associated equipment, as well as the savings estimation.





Finally, there is a table with the percentage of savings by type of energy that would result from the implementation of the proposed measures. In the example these values are the following:

- Thermal savings percentage 5 y 7 %
- Electric savings percentage 7 y 9 %

Please bear in mind that

- This is an estimation range varying from a top number and a bottom number these are based on the implementation of all recommended measures and always compared to the best available technology. Hence, these are maximum ranges of expected savings.
- The total savings will depend on the actual consumption.

In case you want to save the final report document, print it, etc ... you can have it in PDF format, by clicking on "View document in PDF format" at the top of the final energy assessment report.

5. ABB PumpSave

5.1. Tool description

Available in: http://www.abb.com/product/seitp322/5fcd62536739a42bc12574b70043c53a.aspx

To access to this tool is necessary to download before the software from company webpage indicate above. Once software has been downloaded you can use it. It is important to indicate that this tool is developed in excel file so it is not necessary to install any software, only download and open excel file. To do an assessment is not necessary to complete different stages due to all information is in main screen shows in Figure 17.



Figure 17: ABB Pump Save tool, main screen.





Language can be chosen by clicked in window located in the top right area of the screen.

To do a completed assessment is necessary to follow the following steeps:

System data: it is requested information about liquid density (kg/m³) and static head (m).

Pump data: it is requested information about pump, like efficiency (%), pump max head (m), nominal head (m) and pumping flow (m³/h).

Existing flow control: it is requested information about what flow control is installed. It is possible to select: "throttling control", "on / off" and "hydraulic control".

Motor and supply data: In this area information about electric engine must be completed, like supply voltage, power and performance.

Operating profile: It is requested information about how many yearly operation hours the engine has and what is the profile charge.

5.2. ABB PumpSave report

As a result tool offers several results as are show in Figure 18.



Figure 18: ABB PumpSave economy results

Main offered results are saving percentage, annual energy saving and annual CO₂ reduction. Moreover economy results like payback time or net present value are also calculated.

To give additional information some graphs are shown in which energy consumption in current and efficiency energy situation is offered and comparison between flow rate and power demand by speed driver and by current regulation control are given.







Figure 19: ABB PumpSave energy graphs

To finish is necessary to mention that by click in "save calculation" button is possible to save the assessment process and by click in "send to default printer" is possible to print it.

6. Eco8

6.1. Tool description

Available in: <u>http://www.schneider-electric.com/products/ww/en/5100-software/5110-electrical-design-software/2235-eco-8/</u>

To access to this tool is necessary to download before the software from company webpage indicate above. Once software has been installed in your computer is possible to use it as is described below. In main screen shows in Figure 20 are 5 steeps to complete the assessment process. These processes are:

Project information: it is requested general information about project name, company name; responsible to do the assessment, etc... these fields are not mandatory to be completed. However is recommended to do it, due to tool allows saving files in your computer and this information can be useful to identify a calculation process saved in your computer.





8) Eco8 -			
File Edit View Calculate Project H	Help		
🗋 🖛 🖪 💈 û 🖬 👼		Installation 1	>>
Project information	tallation Installation characteristics Cyclic duty Results Conservation		
Project name			
Name of installation			
Originator Company			
Person responsible			
Project Company			
Darcon racooncibla			
r craoi r caponalaic			
Installation site			
Date of the calculations	16-oct-2013		

Figure 20: Eco8 main screen, project information definition

Type of installation: it is necessary to indicate if installation is for industrial or for building applications; moreover the use of engine must be indicated choosing pump or fan processes. In this stage if there is any control system of process like bypass in pumping or dumper in fans must be clicked.

Clait Re GR Ves Calute Road Heb Clait Clait Clait Clait Project information The of retalation is notabilities defactoristics	cd Cyclic duty Results Consolidation	Patalation 1	22	00
Partial Partial <td< td=""><td>Table guide wave control is the increasing of the</td><td>pe of installation selection</td><td>of the pump which allees</td><td></td></td<>	Table guide wave control is the increasing of the	pe of installation selection	of the pump which allees	

Figure 21: Eco8 type of installation screen

Installation characteristics: power of electrical engine must be indicated, with this information tool establishes a predetermined values of current, cos phi and engine performance, however this values can be modified. Moreover is possible to indicate IP protection grade of device from IP2* to IP5*. With this information software offers the model of speed driver to be installed in this application. At the end is possible to indicate the price of





equipment that must be obtained from key actors and the price of electricity. This information will be used to calculate economy payback time.



Figure 22: Eco8 installation characteristics screen

Cyclic duty: this screen offers possibility to indicate what is the operating profile charge of the engine, indicating how many hours is working the engine at different power and how many hours or days per year operates this process. It is recommended to complete it with information obtained from grid analyzer in measuring process.



Figure 23: Eco8 profile charge definition screen

6.2. Eco8 report

Results: It is lastest window of software. It offers information about how much active and reactive energy can be yearly saved, what is yearly economy savings and what is the economy payback time of the investment measured in month.





] Eco8 -					
le Edit View Calculate Project	t Help				
l 🛋 🖽 🖻 🖻 🛍 🖬				Installation 1	<u>) () () () () () () () () () (</u>
roject information Type of	installation Installa	tion characteris	tics Circlic duty Results Consolidation		
	Results				
Active power Reactive power	Without Altivar W	/ith Altivar	kWh\year kVarjyear		_
	buras ba	or 1*		Main results	
Annual money savi	8734 €/year]
Reactive energy saving	74265 kVar/year				
Payback	17 month(s)				

Figure 24: Eco 8 result screen

In case you want to save the final report document, print it, etc ... you can have it in PDF format, by clicking on "File" menu and after that in "Save as" or in "Configure printer" options.

7. PEP

7.1. Tool description

Available in: https://ecenter.ee.doe.gov/em/tools/Pages/Downloads.aspx

To access to this tool is necessary to download before the software from U.S department of energy webpage indicate above. Once software has been installed in your computer is possible to use it as is described below. In main screen shows in Figure 25 are 8 steeps to complete the assessment process. These processes are:

Steep 1 – Case information: In this screen general information about cooperative may be indicated, like: name, type of industry and contact name. There are other not mandatory fields like region or country that have not to be completed, moreover due to is a tool develop in US European regions are not available.

Step 1 - Case Informa	tion		1 2 3 4 5 6 7 8
Welcome to PEP. You are not currently lo your local desktop as XML format using th	gged in or registered e "Save to File" opti	. You will still be able to work	c on a new case but the data will only be saved to
	Start New		
Enter a name for your case and a name for industry in the drop down list please selec savings will be calculated using generic na industries.	or the plant or facility t Other and enter yo ationwide defaults. C	7. Then enter the basic inform ur industry. Please note that lick on the tool tip icon next t	nation about the facility. If you do not see your if you select Other, then the energy and cost to the industry entry to view definitions for all
	Case Name 0	ejemplo 1]
	Plant Name]
	State/Region		v
	County		V
	Industry 🕫	Food, Beverage & Tobacco	
	Contact Name]
	Contact Email]
	Save to F	Save & Continue	

Figure 25: PEP software main screen





After that by clicking in save and continue button is possible to pass to the next screen. **Steep 2 – Energy use systems:** In this screen what systems are installed in the cooperative may be indicated by click as it is shown below:

tep 2 - Energy Use Systems 1 2 3 4 5 6 7 8 ect all of the energy use systems that are in use at your plant. It is important that you understand the definitions that PEP uses for each energy system. For definitions of each energy use system, click on the tool tip next to the system name.					
*This step cannot be skipped as it is imperative to the functionality of PEP.					
Case Name: ejemplo 1	Case Status: Offline 🕖				
	A :				
Combined heat and power (cogeneration) 🕫					
Compressed Air 🛛 🕫	V				
Electrochemical processes 🛛 🕖					
Fans and Blowers 🛛 🕫	\checkmark				
Industrial Facilities (Lighting, HVAC, and Facility Support) 🛛 🕫	V				
Materials handling 🛛 🔞	V				
Materials processing					
Process cooling and refrigeration					
Process heating 🛛 🕫					
Pumps 0	¥				
Steam Generation Equipment 🛛 🕫	V				

Previous Save to File Save & Continue

Figure 26: PEP software energy use systems definition

After that by clicking in save and continue button is possible to go to the next screen.

Steep 3 – Energy use systems scorecards: In this screen there are four questionnaires to know what in the energy management. These questionnaires are: general energy management questions, compressed air scorecard, pumps scorecard and steam generation equipment scorecard. In each of these several questions about energy management plan, operation condition and maintenance about equipment are requested.





Step 3 - Energy Use Systems Scorecards 1 2 3 4 5 6 7 8

This step is optional; however, your answers to the questions below affect the potential end use savings and recommendations shown in the results.

If you wish to skip this step, click on the Step 4 icon in the top-right corner of the screen.

Case Name: ejemplo 1	Case Status: Offline 🕸
General Energy Management Questions	^
Does your company have a formal written energy management plan?	
Have you formed an energy management team at your plant?	
Does your company have a formal method of communication in place	for employees to suggest energy saving opportunities?
Does your company use life cycle cost analysis to evaluate the econor large systems?	nics of energy efficient equipment when making new purchases of
Yes No	
Does your company establish required payback periods for energy eff Yes No Reset this	cient improvement projects? Scorecard
Compressed Air Scorecard	^
Your Compressed Air System	
Have you developed a basic block diagram of the system?	
Have you developed a pressure profile of your system to determine pr	ak demand and dynamics of demand?
Have you estimated total compressed air flow during different shifts?	
Ves No	
Have you measured pressure at various points in the system to deterr Yes No	nine pressure drop?
Have you measured compressed air temperature at various points in t	he supply system?
Have you estimated leak load?	

Figure 27: PEP software steep 3 screen

After that by clicking in save and continue button is possible to pass to the next screen.





Steep 4 – Production information: Complete this information is optional. The purpose is to evaluate energy intensity and energy savings on per unit of production basis. By click in link "Add new production stream" is possible to add new products.

Physical Onits of Production					
Use this screen to enter prod energy savings on a per unit o	luction information for of production basis.	your plant. This inform	ation will I	be used to	calculate energy intensity and
Examples					
box and the average n	umber of employees pe	er period.	want to n		une word Employees in the Ohr
 Gross Sales - If your provide the sales. In that case you sales. In that case you sale the sale of th	would enter "Gross Sal ve examples you are fre o impact on the calcula nit of production (or wh	les Dollars" in the Units ee to enter any type of ations of total energy sa hatever metric you enter	metric tha wings by P red).	t measure EP. It is or	ur production based on gross gross sales amount per period. s production or activity at your ily used for your final report to
Gross Sales - If your pr sales. In that case you As you can see from the abov plant. This information has nu show costs and savings per ur Case Na	would enter "Gross Sal ve examples you are fre o impact on the calcula nit of production (or wh ame: ejemplo 1	les Dollars" in the Units ee to enter any type of ations of total energy sa hatever metric you enter	metric tha wings by P red).	t measure EP. It is or Case Stat	ur production based on gross gross sales amount per period. s production or activity at your ily used for your final report to tus: Offline 🕐
Gross Sales - If your p sales. In that case you As you can see from the abov plant. This information has n show costs and savings per ur Case N: Production Line Name	vould enter "Gross Sal ve examples you are fre o impact on the calcula nit of production (or wh ame: ejemplo 1 Product Name	es Dollars" in the Units les Dollars" in the Units ee to enter any type of tations of total energy sa hatever metric you enter Average Quantity	Units	t measure; EP. It is or Case Stat	ur production based on gross gross sales amount per period. s production or activity at your ly used for your final report to tus: Offline Percent Consumption
Gross Sales - If your p sales. In that case you As you can see from the abov plant. This information has n show costs and savings per ur Case N: Production Line Name	vould onter "Gross Sal ve examples you are fre o impact on the calcula nit of production (or wi ame: ejemplo 1 Product Name	Average Quantity No data to display	Units	t measure t measure EP. It is or Case Stat	ur production based on gross gross sales amount per period. s production or activity at your ly used for your final report to tus: Offline () Percent Consumption ()
Gross Sales - If your p sales. In that case you As you can see from the abov plant. This information has n show costs and savings per ur Case N: Production Line Name	vould enter "Gross Sal would enter "Gross Sal e examples you are fre o impact on the calcula nit of production (or wi ame: ejemplo 1 Product Name	Average Quantity No data to display	Units	t measure: EP. It is or Case Stat	ur production based on gross gross sales amount per period. s production or activity at your ily used for your final report to tus: Offline () Percent Consumption ()

Figure 28: PEP steep 4 screen

In the following figure is possible to see one example of product introduce in tool.

1 2 3 4 5 6 7 8 Step 4 - Production Information (Optional) **Physical Units of Production**

Use this screen to enter production information for your plant. This information will be used to calculate energy intensity and energy savings on a per unit of production basis.

Examples

- Production If your plant measures its production by weight then you might enter "Tons" in the Units box below and you would enter the average number of tons of product that you produce per period.
- Would enter the average number of tons of product that you produce per pendo.
 Employees -You might track your energy costs are per employee. Then you would enter the word "Employees" in the Units box and the average number of employees per period.
 Gross Sales If your production lines are more complicated you may want to measure your production based on gross sales. In that case you would enter "Gross Sales Dollars" in the Units box and the average gross sales amount per period.

As you can see from the above examples you are free to enter any type of metric that measures production or activity at your plant. This information has no impact on the calculations of total energy savings by PEP. It is only used for your final report to show costs and savings per unit of production (or whatever metric you entered).

	Case Name: a			Case Status: Offline 🕚			
	Production Line Name	Product Name	Average Quantity	Units	Period	Percent Consumption 🔍	
Edit Delete	fermentation	wine 5400		m3	Annual		
Add New Produc	tion Stream						
		Previous Sav	e to File Save & Co	ntinue			

Figure 29: PEP production information

After that by clicking in save and continue button is possible to pass to the next screen.





Steep 5 – Supplied energy: Complete this information is optional. The purpose is to evaluate energy consumption and cost of cooperative, by click in "add new energy stream" link is possible to add different energy suppliers with their own information like quantity of energy (kWh), cost and type of energy.

Step 5 - Supplied E	nergy			1	2 3	4 5 6 7 8
Use the following sections to enter data a accurately profile your facility. To track y	from utility bills and/or i our energy usage over t	meter recor time, see th	rdings. Enter he <u>eGuide Lit</u>	ing this data is <u>te</u> .	optional but do	ing so will help PEP to more
For each energy stream you will need to name, enter the average quantities and different energy streams is acceptable, a	enter account informati units purchased, and se s PEP will calculate the	ion for each lect the per annual data	n meter for v riod the purc a, but do not	vhich you have hase reflects. E t enter more th	data. For each Entering differer an 1 year of da	account enter a Meter ID or nt period intervals for ta.
If you need additional information on ind	ividual columns, please	<u>click here.</u>				
Case Name	e: a			Case	e Status: Offlin	ne 🕖
Meter ID Energy Type	Use Per Period	Units	Period	Cost Per Period	Unit Cost	Source Energy Factor
Meter ID Energy Type Electricity		Cost	Per Period ce Energy Fa	actor	3,182	\$
Use Per Period Annual	kWh	~	5,			
						Update Cancel
Add New Energy Stream						,
	Previous	Save to File	Save	& Continue		

Figure 30: PEP supplied energy information

After that by clicking in save and continue button is possible to pass to the next screen. **Steep 6 – Supplied energy:** This screen allows defining the percentage of total annual source energy that each major system in cooperative consumes by click in the gap available for each devices.

Step 6	; -	Energy Use Distribution		1	2 3	4 5 6	78
Use this scre	en t	o define the percent of total annual source energy that each ma	ajor syst	em in your pla	nt consumes.		
NOTE: PEP percentages estimate you	prov if y ir ac	ides U.S. default percentages for you based on the industry tha ou are unsure of the actual percentages that each energy use sy tual percentages and enter them in the boxes below.	it you se ystem us	lected for this es. However,	case. You may for more accura	use these defau te results you s	ilt hould
Default ener for all indust by Dr. Ali Ha	gy c ries Isan	istribution values are based on the Energy Information Adminis except cement. Default energy distributions for the cement indu beigi of the Lawrence Berkeley National Laboratory on Decembe	tration 2 ustry we er 7, 201	010 <u>Manufact</u> re updated to 1.	uring Energy Co more accurately	nsumption Surv portray the ine	r <u>ey (MECS)</u> dustry norm
Please enter the usage va	onl	y the usage or percent values and not both. If both are entered, based on the default percentages, please click the recalculate	, usage 1 button.	vill take prece	dent over perce	ntage. If you w	ish to reset
If you need	addi	tional information on individual items (rows) please <u>click here.</u>					
		Case Name: a		Cas	e Status: Offlin	e 😣	
		Meter ID		Total Annual S	ite Energy Use	Unit	
	⊡	1			540.000,0	kWI	1
		Meter ID					
			Usag	e (Source)	%		
		Industrial Facilities (Lighting, HVAC, and Facility Support)		102.859,27		19,0	
		Other		437.140,73		81,0 %	
		Total Annual Site Energy Use	Eave	540.000,00	I]	100,0 %	
			<u>54V</u> e	Cancer Resto	pre Derault Distr	IDUUOIIS	
		Provinue Save to Elle	Sava	Continuo			

Figure 31: PEP energy used distribution

After that by clicking in save and continue button is possible to pass to the next screen.





Steep 7 – Energy saving opportunities: This screen allows indicating for each device what is the possibility to develop improvement measures selecting: "high", "medium" or "low".

Step 7 - Energy Savings Op	portunities 12	2 3 4 5 6 7 8
Use this screen to characterize the potential ener will only show systems that PEP does not have sco Use the criteria listed below to categorize your en	gy savings opportunities for the various maj recards for or that answers were not entere ergy use systems.	or systems in your plant. This step d for in the scorecards in Step 2.
High (Default) = No system assessment con	npleted / Don't know	
Medium = System assessment completed b	ut little or no implementation completed	
Low = System assessment completed and s	ubstantial implementation completed	
Case Name: a	Case SI	tatus: Offline 👀
Energy Use System		Energy Saving Opportunity Level
Industrial Facilities (Lighting, HVAC and Facility Support	t)	High × 🗸
Previou	s Save to File Save & Continue	High Medium

Figure 32: PEP energy saving opportunities screen

After that by clicking in save and continue button is possible to pass to the next screen.

7.2. PEP report

As a result of assessment process PEP offers a report in last steep (8) with information about annual energy consume and cost and potential energy saving. In following figure is shown an example of diagrams that are shown as report.

System Name	Site Energy Use (MMBtu)	Potential Energy	Potential Energy	Savings
Industrial Facilities	351.0	Savings (MMBtu)	5avings (%)	High
Other	1.491,6			
Total	1.842,6	52,6		
0.000 (11.600 (14.900)) (14.900) (14.90	1 491,59	[350, 97] 1	3	Annual Usage Potential Savings
0	Other	Industria	l Facilities	
	Syster	n Name		
ential Annual CO2 ased on the potentia D2 emission savings ant. Factors such as jilers make a large d stimated savings and OTE: Actual CO2 sav imary fuels that are bible below shows ar in at contain relatively arbon such as coal (c ad at your plant.	Emissions Savings energy savings identified above, your pl numbers are broad estimates based on in CP system or steam generator efficienc liference in the actual amount of CO ₂ em industry averages only. Ings from fuel/steam energy savings are I used at your plant for process heating, pu age of posterior CO ₂ savis the rame head life/amount of Life/amount of Life/amount of CO ₂ savis head the rame of Life/amount of Lif	ant may be able to reduce dustry averages and are n y and primary fuel source sission saved. These numb based on the primary fuel ower generation and stear team use in your plant. Th a. The high end of the ra ual CO ₂ emission reductio	emissions of CO ₂ . The fn ot meant to reflect actur for energy use systems are source. The exact break means of the second to the second neg is based on fuels the n will depend on the actu	ollowing potential annual al realized savings at you such as furnaces and road estimate based on down of the individual he scope of this tool. The s based on the use of fur t have a high amount of ual primary fuels that are
Potential A	nnual CO ₂ Savings from Electricity: 2	0.052 lb		
	100 0 1 0 0 100			
Potential A	nnual CO ₂ Savings from Fuel: 0 ID			





After that by clicking in the top right button "print" is possible to print the report.

8. AISLAM

8.1. Tool description

Available in:

http://www.idae.es/index.php/relcategoria.1030/id.430/relmenu.347/mod.pags/mem.detalle

To access to this tool is necessary to download before the software from Saving and Diversify Spanish National Institute which webpage is indicated above. Once software has been installed in your computer is possible to use it as is described below. First of all is important to remark that software is in Spanish language, however due to the most quantity of information is about temperatures, energy flows and so on, with the following description is easy to use it. Moreover Software is going to be explained for two main applications:

- Evaluate how much energy we can save isolating a pipe.
- Evaluate how much energy we can save improving isolating in cooling chambers.

Evaluate how much energy we can save isolating a pipe.

Firstly is going to be explained the first case "how much energy can be saved by means of isolate a pipe"



Selection of type of calculation we are going to do: flat plate heat exchanger (placa plana), pipe (tuberias), sphere (esfera), special applications (especiales)

thermal flow (flujo de calor) and reduction by means of isolate (reducción con aislamiento %).





Secondly is neccesary to select what type of calculation we want to use, in this case (evaluate energy savings in pipes) is neccesary to select "tuberias". Moreover calculating conditions can be choosen, the most important options are *"flujo de calor W/m2"* in which is evaluated what is the thermal losses measure in W/m² and *"reducción con aislamiento %"* in which you indicate what is the percentage of energy consumption you want to have respect the case of have pipe without isolating.

In this first example is shown the case of calculate using heat flow conditions.



Figure 35: Aislam screen. Pipe calculation

In this case you indicate what the maximum energy flow you want to have in pipe is. In the right part of the menu is shown the simulation conditions, in the top is possible to select "*flujo de calor*" that menas heat flow or "*espesor de aislamiento*" that means isolating thickness. Choosing the second one will be calculated what the isolating thickness neccesary to have the energy flow previously indicated is. In the example conditions are: exterior temperature $\rightarrow 35^{\circ}$ C, interior temperature $\rightarrow 15^{\circ}$ C, pipe diameter $\rightarrow 150$ mm, isolating polyurethane with thermal conductivity $\rightarrow 0.045$ W/m^oC. With this information by clicking in calculation button results are shown.







Figure 36. Aislam results screen in case: evaluate isolation thickness in piping by means of indicate what the maximum allowable thermal flow is.

As a result is shown that isolation thickness is 51,3 mm. Moreover if we want to know what will be final temperature of water in one pipe as a determinated length is possible to do it by selecting *"thermal flow"* in the top menu and as a result following screen is shown in which is indicated the thickness previously selected and also length pipe in meters can be indicated in screen left size.



Figure 37: Aislam results screen in case: evaluate isolation thickness in piping showing final pipe temperature.

By clicking again in calculation button results are shown, and in example case final pipe temperature is 15,047°C (considering a lengh of 350 m and pipe location in exterior).





If we want to calculate how many energy we can save is possible to do it by selecting "*reducción con aislamiento*" in left menu.



Figure 38: Aislam results screen in case: evaluate isolation thickness in piping by means of indicate what the energy consumption respect don't use isolating is.

In example is indicated 5 %, that means we want that energy consumption will be only a 5 % respect don't use isolating. With these conditions and choosing polyurethane like isolating software indicates that thickness should be unless 30,6 mm.

Evaluate how much energy we can save improving isolating in cooling chambers.

Once how to evaluate energy savings in pipes has been done, second case that can be studied in TESLA is going to be shown, this process is evaluate improvement in cooling chambers by means of type of isolation changing (thickness and / or material).

First of all case of "*placas planas*" must be clicked.



Figure 39: Screen to evaluate savings in cooling chamber walls





In this case only will be shown the case of "*heat flow*" due to there has not sense calculate a cooling chamber without isolating. So it is neccesary to put the maximum value of heat lost we want to have. In example is considered 10 W/m². Afterthat both interior like exterior temperature should be indicated, in this case used values are 15° C and 35° C respectively. To finish what is the type of isolating you want to use also is neccesary to be indicated.



Figure 40: isolating and calculating definition

With these information and by clicking in calculation button software shows results, in example case program indicates a isolating thickness of 87,35 mm. In this same case if we want to reduce heat flow to the middle it should be neccesary 177,35 mm.

SUMMARY

	PINE	ABB PumpSave	Eco8	PEP	AISLAM
Wine cooperatives	Apply to estimate what is the current situation of the cooperative and to inventory types of energy and main installed components	It can be useful to evaluate energy savings in pumping processes mainly to move wine for one tank to another one.	It will allow to estimate how much energy can be saved installing frequency drivers in reception phase	Apply to estimate what is the current situation of the cooperative and what is the energy savings potential	Very useful to calculate thermal losses in cooling fermentation from cooling machine to fermentation tanks
Olive Oil cooperatives	Apply to estimate what is the current situation of the cooperative and to inventory types of energy and main installed components	Not apply	It can be useful to calculate potential savings in electrical engines installed mainly in centrifugation and grinding processes	Apply to estimate what is the current situation of the cooperative and what is the energy savings potential	Not apply
Animal food production	Apply to estimate what is the current situation of the cooperative and to inventory types of energy and main installed components	Not apply	It can be useful to calculate potential savings in electrical engines installed mainly in grids or pellet machines	Apply to estimate what is the current situation of the cooperative and what is the energy savings potential	Very useful to evaluate how much heat are lost from the steam boiler to final application
Fruit and vegetable cooperatives	Apply to estimate what is the current situation of the cooperative and to inventory types of energy and main installed components	Not apply	It is useful to calculate energy savings in conveyor belts during transport process	Apply to estimate what is the current situation of the cooperative and what is the energy savings potential	Useful to calculate the improvement that can be reach by means of increase thickness or change wall materials in cooling chambers





INDEX

1.	Int	roduction			
2.	Ta	rget3			
3.	3. Methodology				
4.	PIN	NE4			
4	.1.	Tool description4			
4	.2.	PINE Report10			
5.	AB	B PumpSave15			
5	.1.	Tool description			
5	.2.	ABB PumpSave report			
6.	Eco	0817			
6	.1.	Tool description			
6	.2.	Eco8 report19			
7.	PE	P20			
7	.1.	Tool description			
7	.2.	PEP report			
8.	AIS	SLAM			
8	.1.	Tool description			
SU	SUMMARY				