

 <b>DITEN</b> Department of Electrical, Electronic, Telecommunications Engineering and Naval Architecture Polytechnic School, University of Genoa		 <b>MAI Lab</b> <i>Measurement &amp; Automation for Industry</i>
	<i>Project:</i> <b>DRIVES: Drive Specification Maker</b>	<i>Doc n°:</i> <b>MAI.14.112 – ver. 01</b>
	<i>Title:</i> <b>DRIVES - Introduction to the Tool</b>	<i>Pag.:</i> <b>1/13</b>



## Introduction to the tool

1	11.03.2014	First issue	M.Vanti	P.Pinceti	P.Pinceti
Ver.	Date	Review	Editing	Verified	Approved

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## 1 Introduction to DRIVES

Motors represent the most common electrical load for industries and public utilities (gas, water, etc.). A significant part of these motors work at variable speed, and are controlled by means of electronic drives.

CLUI promoted a research on drive-based applications for pumping systems, (together with the most important Italian water and sewerage companies). The document N° M3981X11 published by Exera in October 2011 summarizes the results of this activity. The software tool DrIlveS “Driver Specification Maker” is a practical application of these results.

**DrIlveS helps engineers in the process of definition of the technical characteristics of a drive for the given application, and produces the technical specification of the drive. DrIlves helps avoiding misunderstandings between customers and producers.** DRIVES has a web-based approach (see Figure 1), and allows a user define (save, load and edit) his own projects from different PCs (an internet connection is required).



Figure 1: web homepage of DRIVES

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## How does DrIlveS work?

The target of the tool is to give to the producer all the information necessary to identify a drive that fulfill the customer requirements. DrIlveS guides the customer in the definition of the features of the drive (tailored for the considered application) using the following tools:

- ✓ variable structure of the data (only necessary information requested with different levels of detail),
- ✓ menu (or checkboxes) to select among standardized values,
- ✓ default values (given by international standards),
- ✓ assisted fulfillment of the fields,
- ✓ availability of different standards (i.e. ATEX or NEC),
- ✓ identification of the desired features on the basis on simple questions,
- ✓ guided identification of required performances,
- ✓ availability of a free detailed definition of requested parameters (for expert users),
- ✓ free text fields for specific requirements of the customer.

DrIlveS identifies all the features related with the following field:

- ✓ general identification of the drive and the application,
- ✓ electrical system (supply systems, protection, back up, etc.),
- ✓ motor (rated values for existing motors in case of revamping or requested performances for the design of new installations),
- ✓ drive characteristics (control solutions, performance, architecture),
- ✓ interface (HMI, signals and solutions for fieldbus solutions),
- ✓ EMC (gives all the data necessary to the seller to evaluate the best solution for the customer),
- ✓ requirements for installation and shipping with different level of detail (for different applications).

The final structure of data is available in HTML or in Microsoft Word format.

DrIlveS provides an additional tool for calculating the energy saving that is obtained by replacing a throttling control (valve and constant speed motor) with a drive-based control for a pumping application.

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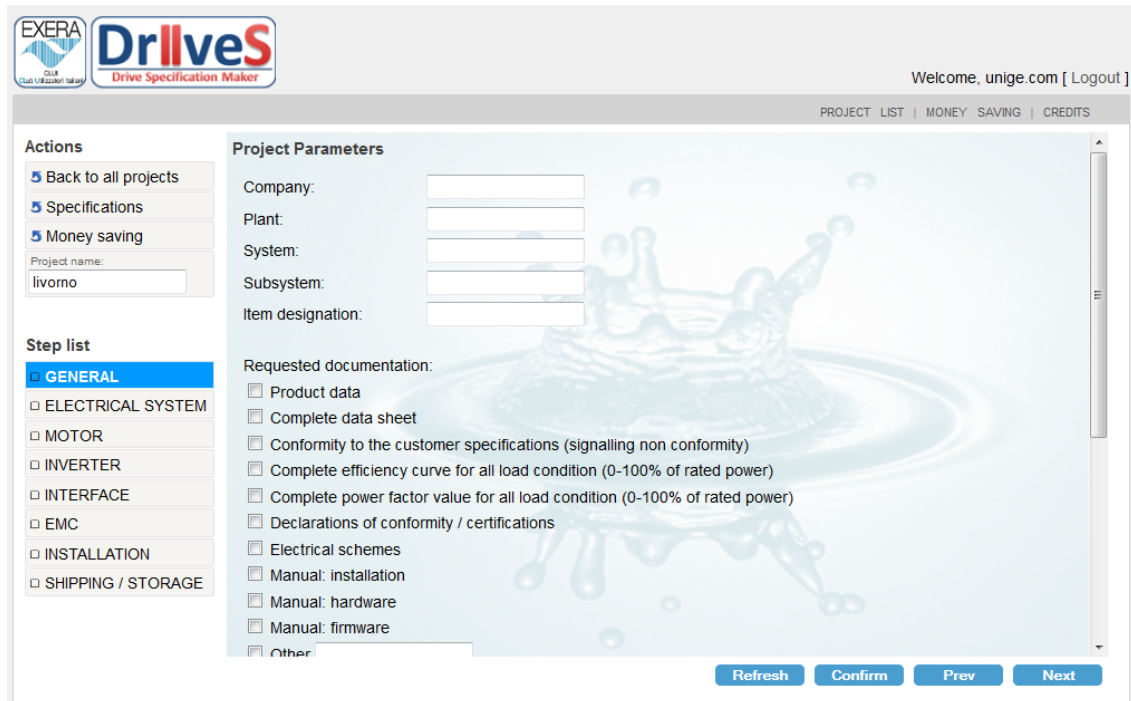


Figure 2: General identification of the system and main classifications (check box and free text field)

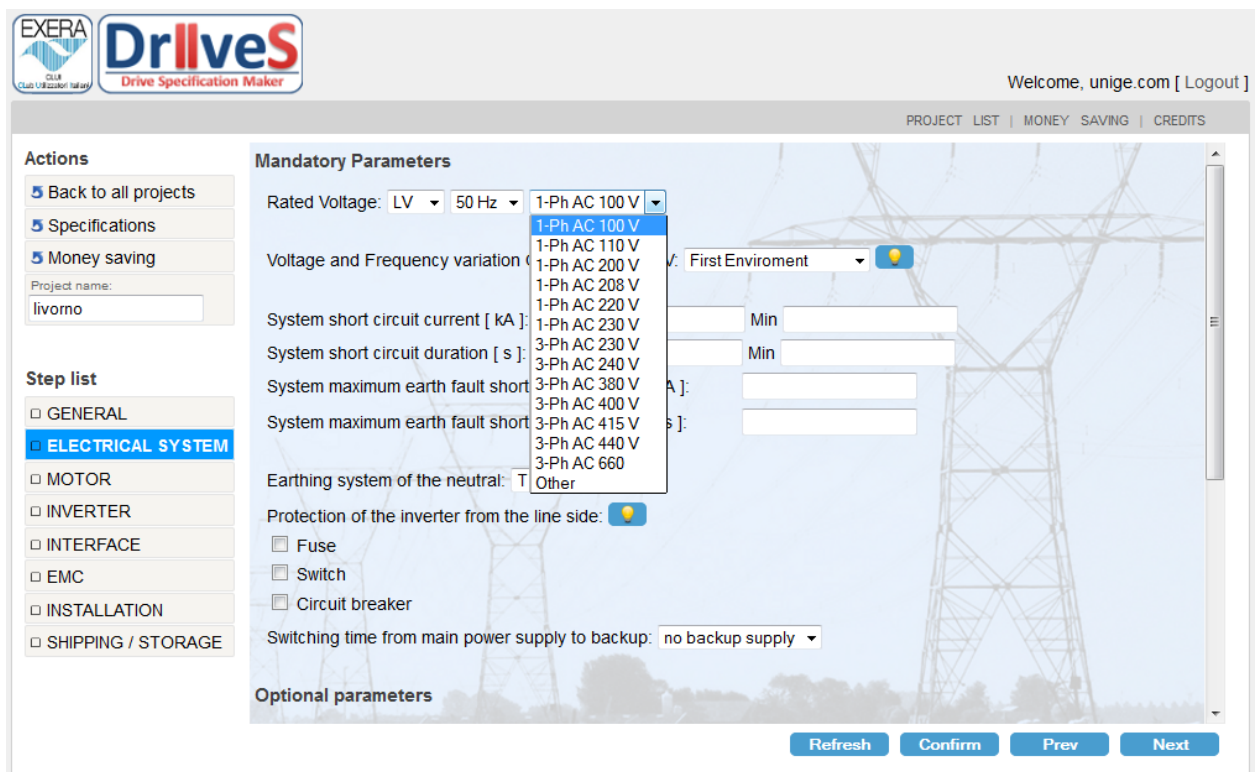
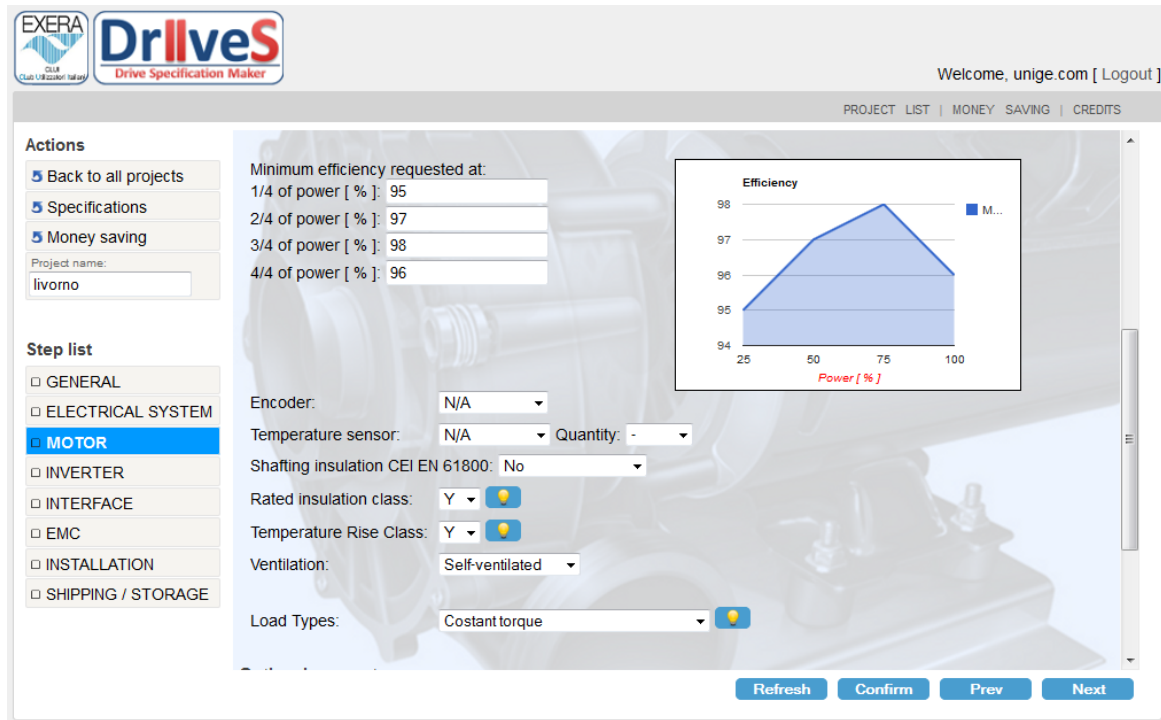


Figure 3: Definition of the electrical system – pop-down menus with standardized values

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Minimum efficiency requested at:

1/4 of power [ % ]: 95

2/4 of power [ % ]: 97

3/4 of power [ % ]: 98

4/4 of power [ % ]: 96

Encoder: N/A

Temperature sensor: N/A Quantity: -

Shafting insulation CEI EN 61800: No

Rated insulation class: Y

Temperature Rise Class: Y

Ventilation: Self-ventilated

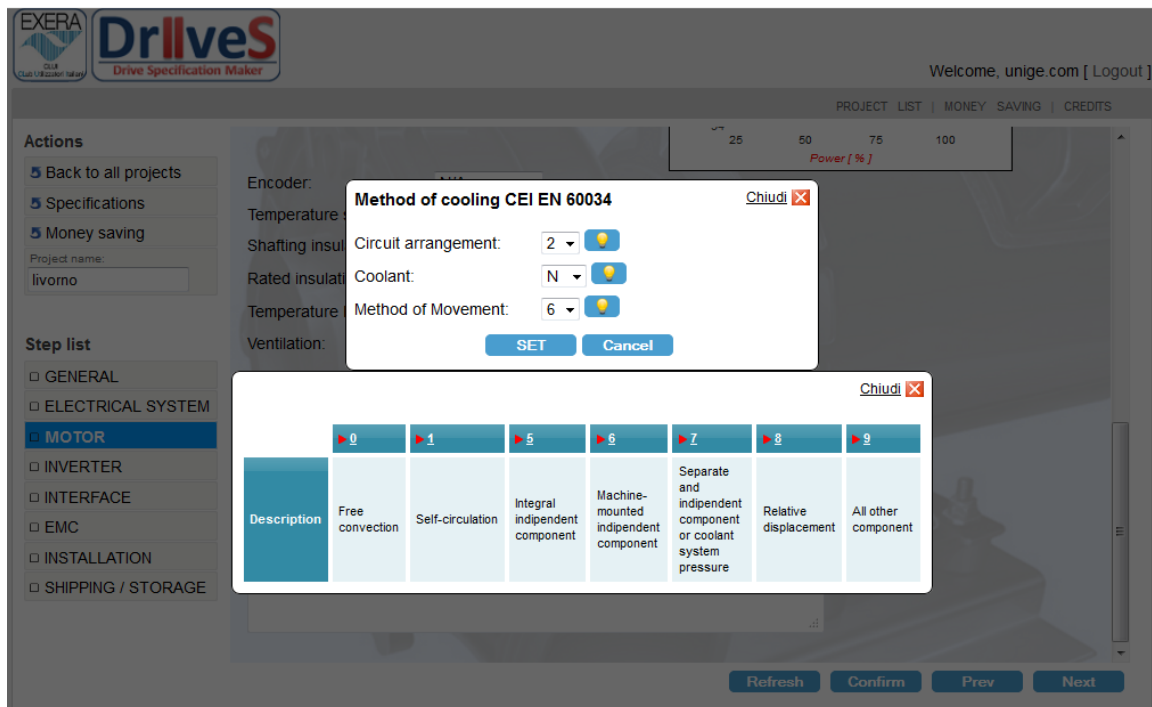
Load Types: Constant torque

Efficiency

Power [ % ]

Refresh Confirm Prev Next

Figure 4: Guided identification of desired performances of the motor (including efficiency)



Method of cooling CEI EN 60034

Circuit arrangement: 2

Coolant: N

Method of Movement: 6

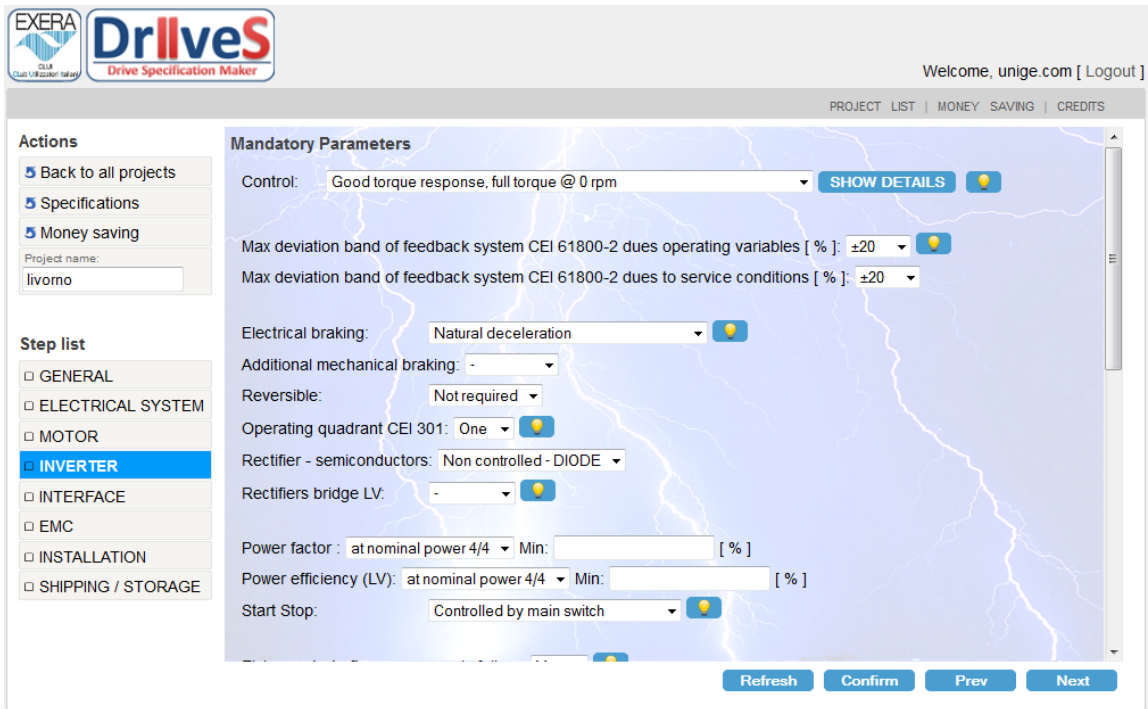
SET Cancel

	0	1	5	6	7	8	9
Description	Free convection	Self-circulation	Integral independent component	Machine-mounted independent component	Separate and independent component or coolant system pressure	Relative displacement	All other component

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Figure 5: Definition of the parameters of the motor – pop-out menus for the selection

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EXERA **DrivesS** Drive Specification Maker

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**Actions**

- Back to all projects
- Specifications
- Money saving

Project name: livorno

**Step list**

- GENERAL
- ELECTRICAL SYSTEM
- MOTOR
- INVERTER**
- INTERFACE
- EMC
- INSTALLATION
- SHIPPING / STORAGE

**Mandatory Parameters**

Control: Good torque response, full torque @ 0 rpm **SHOW DETAILS**

Max deviation band of feedback system CEI 61800-2 dues operating variables [ % ]:  $\pm 20$

Max deviation band of feedback system CEI 61800-2 dues to service conditions [ % ]:  $\pm 20$

Electrical braking: Natural deceleration

Additional mechanical braking: -

Reversible: Not required

Operating quadrant CEI 301: One

Rectifier - semiconductors: Non controlled - DIODE

Rectifiers bridge LV: -

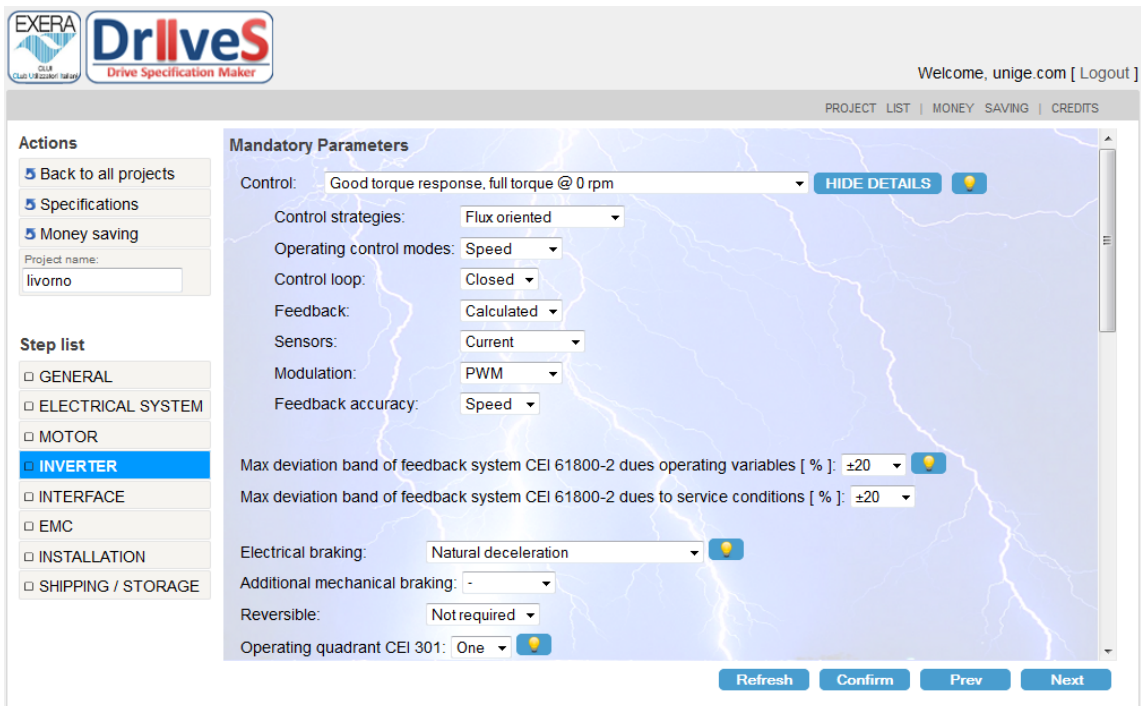
Power factor : at nominal power 4/4 Min: [ % ]

Power efficiency (LV): at nominal power 4/4 Min: [ % ]

Start Stop: Controlled by main switch

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a)



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Project name: livorno

**Step list**

- GENERAL
- ELECTRICAL SYSTEM
- MOTOR
- INVERTER**
- INTERFACE
- EMC
- INSTALLATION
- SHIPPING / STORAGE

**Mandatory Parameters**

Control: Good torque response, full torque @ 0 rpm **HIDE DETAILS**

Control strategies: Flux oriented

Operating control modes: Speed

Control loop: Closed

Feedback: Calculated

Sensors: Current

Modulation: PWM

Feedback accuracy: Speed

Max deviation band of feedback system CEI 61800-2 dues operating variables [ % ]:  $\pm 20$

Max deviation band of feedback system CEI 61800-2 dues to service conditions [ % ]:  $\pm 20$

Electrical braking: Natural deceleration

Additional mechanical braking: -

Reversible: Not required

Operating quadrant CEI 301: One

Refresh Confirm Prev Next

b)

Figure 6: Identification of the desired features of the inverter based on simply question with drop-down menus (a) or based on a detailed definition of all the parameter by the customer (b).



**Figure 7: Interface definition - free text field for additional features**

**Figure 8: Specification output in Microsoft Word format**

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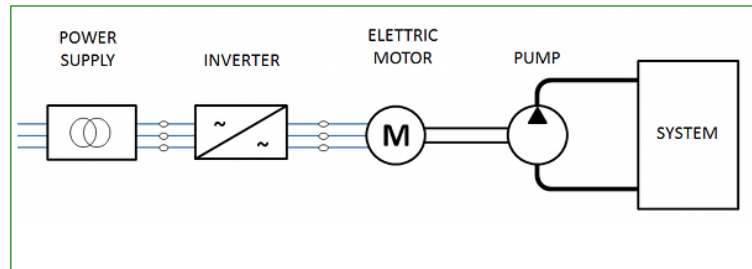
**Drives**  
Drive Specification Maker

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**Actions**

- Back to all projects
- Money saving
- Rendimento inverter
- Rendimento meccanico
- Carico idraulico
- Confronto consumi



Costo installazione	30000	[ € ]
Tasso di attualizzazione	6	[ % ]
Vita utile del gruppo di pompaggio	20	[ anni ]

<b>Risparmio energetico:</b>	102.844 € / Anno	514222 kWh / Anno
<b>VAN:</b>	1.149.618 €	

CEI 315-1 Calculation method of the saving potential related to the adoption of variable speed drives in centrifugal pumping systems - 2011-4

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Report

**Drives**  
Drive Specification Maker

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**Actions**

- Back to all projects
- Money saving
- Rendimento inverter
- Rendimento meccanico
- Carico idraulico
- Confronto consumi

Carico idraulico: [ p.u. ]	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Ore di operazione: [ % ]	0.5%	7.5%	31%	38%	15%	7%	1%
Rimuovi:	✖	✖	✖	✖	✖	✖	✖
Ore annuali di operazione	<input type="text" value="5000"/>	[ h / anno ]					
Percentuale ore annue	<input type="text"/>	[ % ]					
Fattore di carico	<input type="text" value="0.1"/>	[ p.u. ]					
<div>Aggiorna</div>							

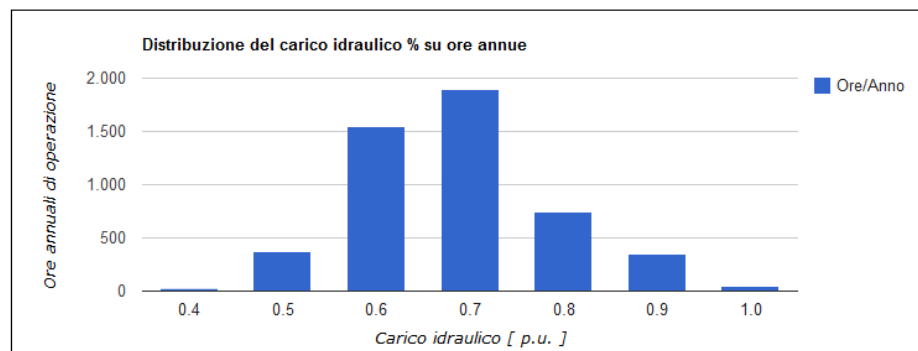


Figure 9: Tool for energy saving calculation in a pumping station