
LHEnergyInfo

More transparency,
greater savings
potential

Sustainability in gear production

LIEBHERR

Liebherr Verzahntechnik GmbH






Motivation – LHEnergyInfo

In a world where efficiency and sustainability determine a company's success, it is essential to keep a close eye on the consumption of energy, compressed air and cooling lubricants in your production.

Imagine if you could monitor, analyze and optimize all this data in real time - with just one app.

Welcome to

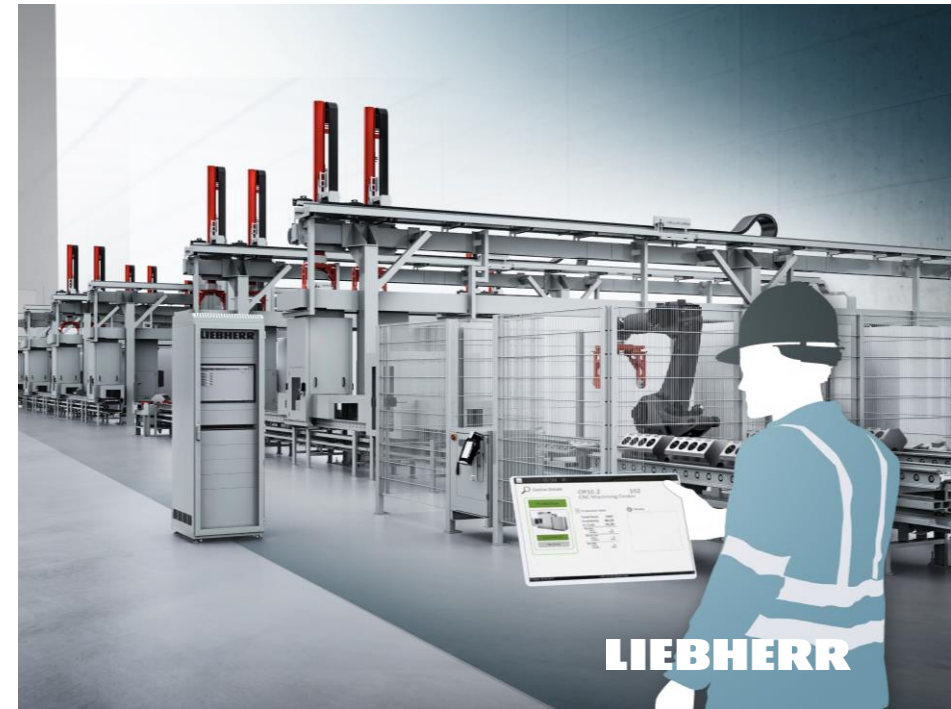
LHEnergyInfo  - your new app for monitoring and optimizing machine tool consumption.

Challenges

In modern production facilities, machine tools are the heart of production.

However, high energy costs, inefficient compressed air consumption and the excessive use of cooling lubricants can drive up operating costs and impact sustainability.

Traditional methods don't show very detailed information and therefore it's not easy to win efficiency quickly. LHEnergyInfo shows its strength with the ability to visualize the context of data and to ensure the right actions.





LHEnergyInfo App



LHMachineInfo

Here you can check the live status of your machines at a glance. Observe changes in real time or analyze recorded measurement values. Define rules what the colors of the signal lamp mean to you.



LHSignalInfo

Analyze the recorded signals and export them e.g. to Excel taking into account all measuring points and their exact time stamp.



LHReportInfo

The dashboard displays the most important reports and updates them constantly. Improve your controlling by analyzing reports and statistics.



LHEnergyInfo

The app visualizes the energy consumption of the machine, such as electricity, air or cooling water. The energy costs are recorded per workpiece or as average values for all workpieces. This allows hourly rates to be calculated more precisely or CO2 equivalents to be determined for sustainability reports. Graphical evaluations of energy consumption over a period of time or shifts can be created.

the solution is - LHEnergyInfo

LHEnergyInfo offers you a user-friendly platform that gives you detailed insights into the consumption of your machine tools.

With our app you can:

- Monitor energy consumption

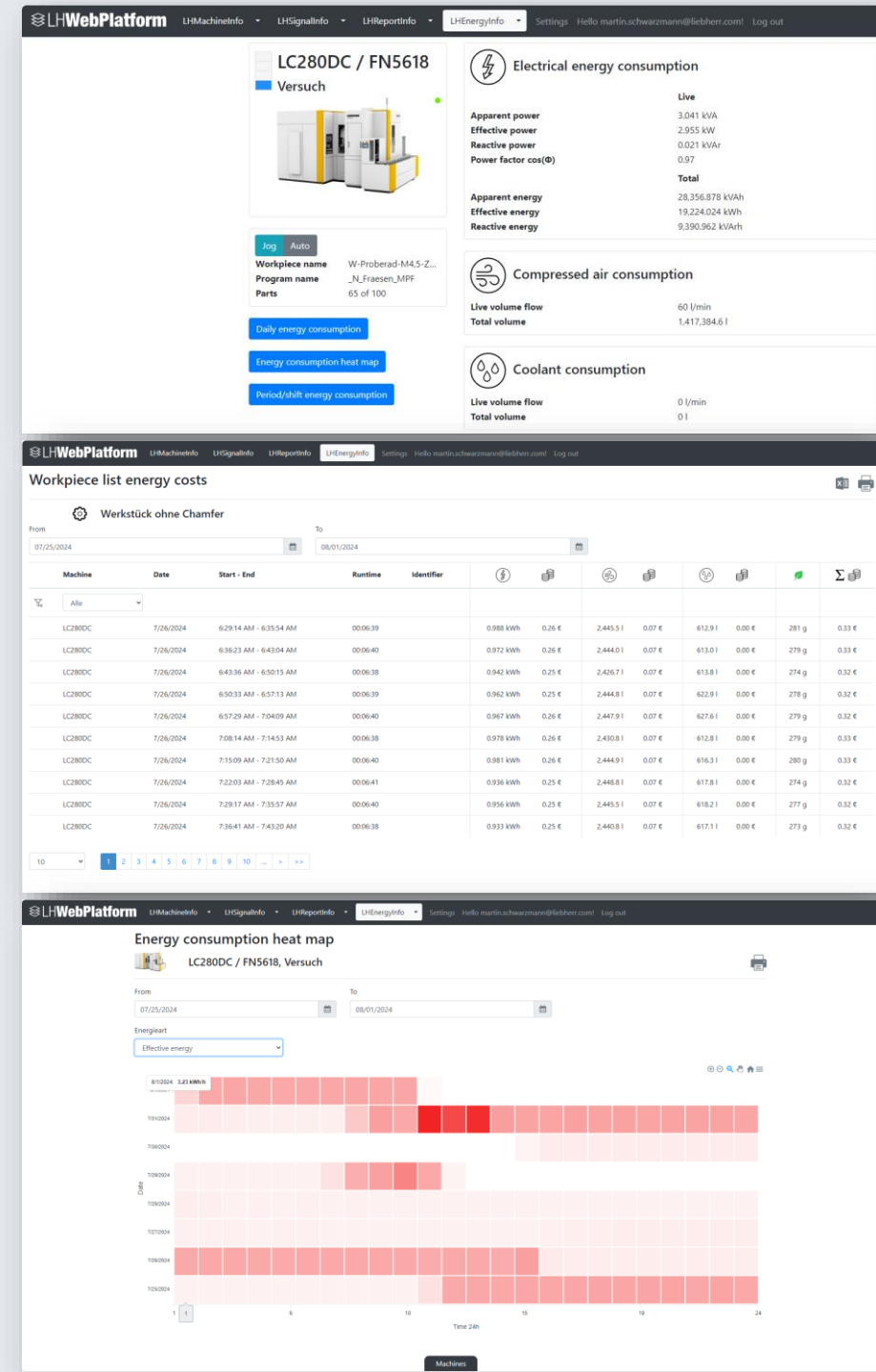
Get real-time data on each machine's power consumption and identify instant savings potential.

- Use compressed air efficiently

Analyze compressed air consumption and identify leaks or inefficient use to reduce your compressed air costs.

- Optimize cooling lubricants

Track the use of cooling lubricants and ensure that they are used efficiently and in an environmentally friendly way.



Required Hardware

Various sensors are required for precise and transparent measurements, such as

Sensor for energy consumption

- SIEMENS SENTRON PAC 4220 - V-035926
- SIEMENS SENTRON PAC 4220 with Power factor correction - V-035947

Retooling of existing Machines, the sensors will be placed inside of the control cabinet

- SIEMENS SENTRON PAC 4220 - V-035984
- SIEMENS SENTRON PAC 4220 with Power factor correction - V-035983

The installation will be not on the control cabinet door !

Sensor for compressed air

- The SD6500 (IFM brand) compressed air meter is used to monitor the compressed air consumption (V-035582)

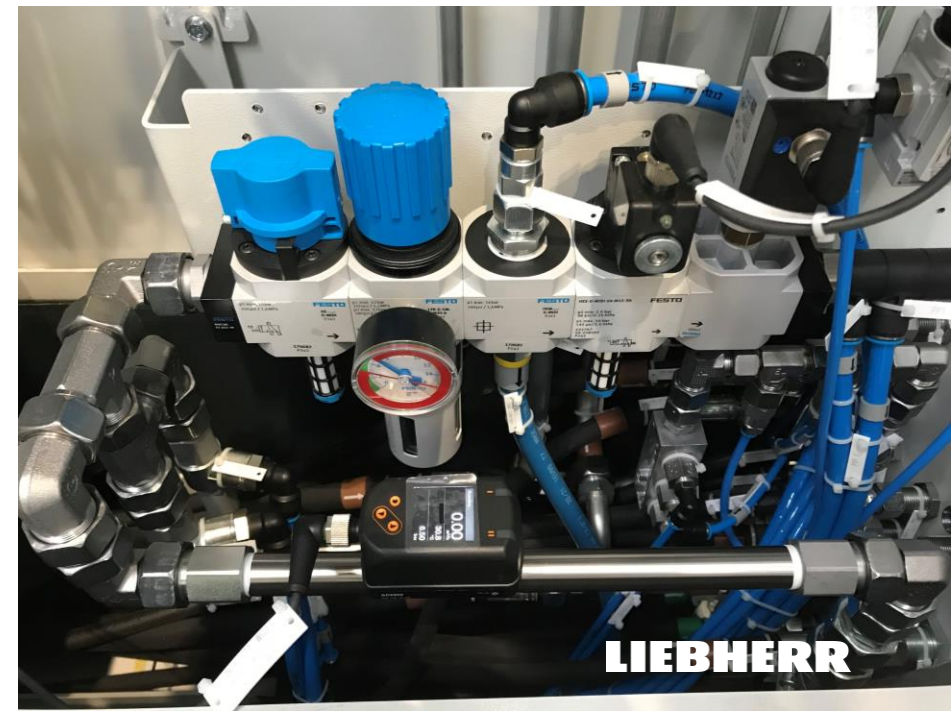
Sensor for Coolant flow measurement

- Flow sensor SA5000 (IFM brand) (V-035583)



Picture Source: [SA5000 - Flow sensor - ifm](#)

Picture Source: [Sentron Pac 4220](https://mall.industry.siemens.com/mall/de/de/Catalog/Product/7KM4220-1BA01-1EA0)
<https://mall.industry.siemens.com/mall/de/de/Catalog/Product/7KM4220-1BA01-1EA0>



Advantages

— Transparency and control:

By closely see the consumption of your machines in real time and at a glance. Our app offers intuitive dashboards and detailed reports to help you make informed decisions.

— Cost reduction:

monitoring and analyzing, you can quickly identify and eliminate inefficiencies. Reduce your energy costs, minimize compressed air consumption and optimize the use of cooling lubricants.

— Sustainability:

Make an active contribution to environmental protection by reducing consumption in your production. Less energy consumption and more efficient use of resources mean a smaller ecological footprint.

— User-friendliness:

Our app is easy to install and use. No complicated technology, no long training sessions. You have immediate access to all important data.

LC280DC / FN5618
Versuch

Log Auto

Workpiece name AAA-RUESTEN
Program name _N_Fraesen_MPF
Parts 65

Daily energy consumption
Energy consumption heat map
Period/shift energy consumption

Electrical energy consumption

Apparent power	2.845 kVA
Effective power	2.74 kW
Reactive power	0.011 kVAr
Power factor cos(Φ)	0.96
Total	
Apparent energy	28,521.988 kVAh
Effective energy	19,308.524 kWh
Reactive energy	9,391.323 kVAh

Compressed air consumption

Live volume flow	60 l/min
Total volume	1,571,442.5 l

Coolant consumption

Live volume flow	0 l/min
Total volume	0 l

Machines

Period/shift energy consumption
LC280DC, Halle 1-A2

From 07/29/2024 To 08/05/2024

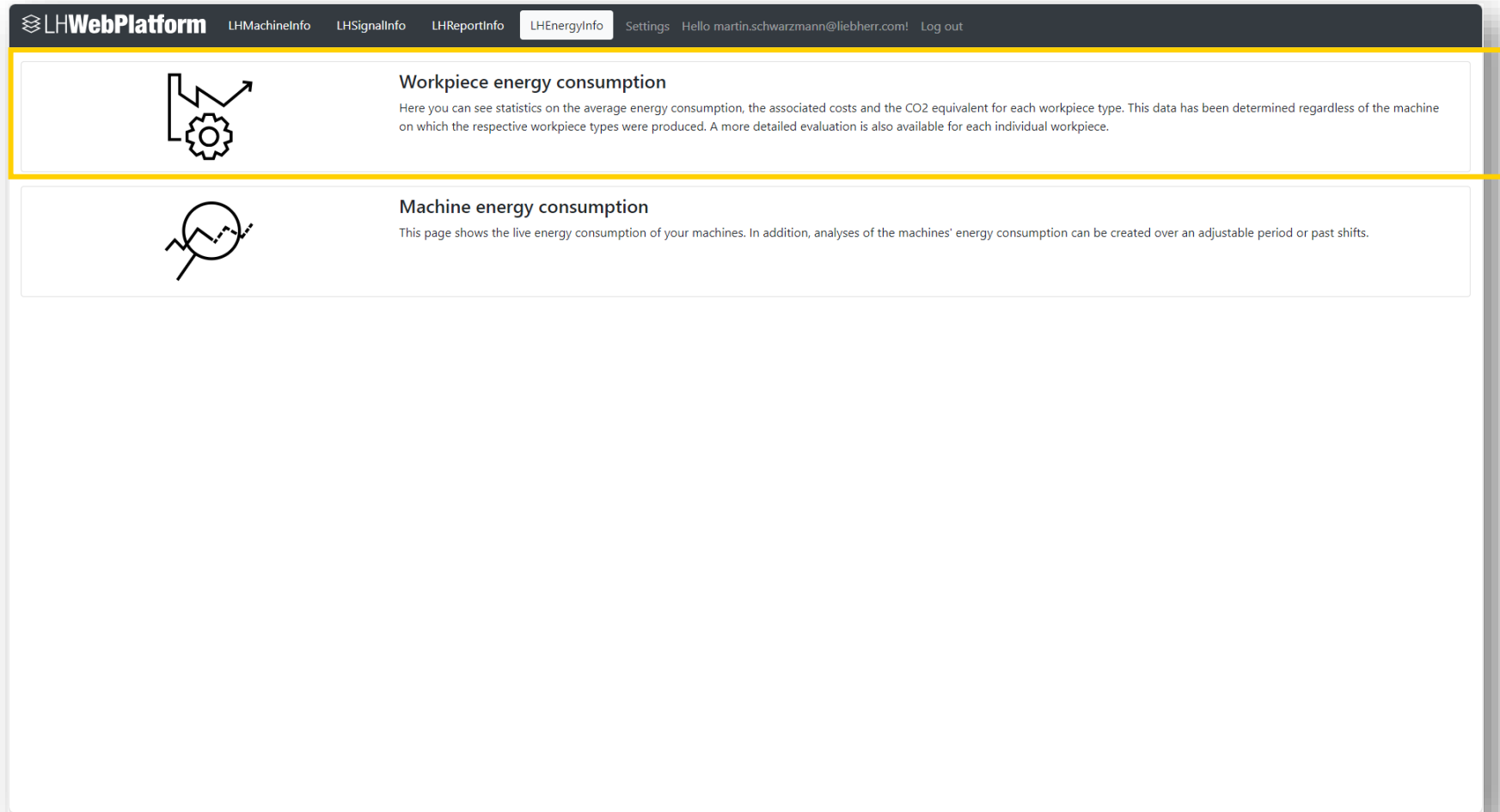
Energieverbrauch der Maschine im gewählten Zeitraum

Electrical energy consumption 769.048 kWh 203.80 € 292.238 g CO ₂	Compressed air consumption 1.850,724.6 l 43.92 € 71,270 g CO ₂	Coolant consumption 459,397.5 l 0.00 € 0 g CO ₂
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Energieverbrauch Schichten

Date	Start - End	Name	Electrical (kWh)	Electrical (€)	Compressed Air (l)	Compressed Air (€)	Coolant (l)	Coolant (€)	CO ₂ (g)
7/29/2024	6:00:00 AM - 2:00:00 PM	Early shift	71.726	19.01	148,605.6	3.53	35,643.8	0.00	22.53
7/29/2024	2:00:00 PM - 10:00:00 PM	Late shift	89.329	23.67	163,716.4	3.88	40,519.5	0.00	27.56
7/30/2024	6:00:00 AM - 2:00:00 PM	Early shift	68.457	18.14	168,055.5	3.99	42,110.9	0.00	22.13
7/30/2024	2:00:00 PM - 10:00:00 PM	Late shift	63.669	16.87	170,046.1	4.04	42,684.7	0.00	20.91
7/31/2024	6:00:00 AM - 2:00:00 PM	Early shift	63.062	16.71	168,907.0	4.01	42,228.9	0.00	20.72
7/31/2024	2:00:00 PM - 10:00:00 PM	Late shift	64.234	17.02	170,715.8	4.05	42,885.6	0.00	21.07
8/1/2024	6:00:00 AM - 2:00:00 PM	Early shift	63.014	16.70	167,279.9	3.97	41,709.5	0.00	20.67
8/1/2024	2:00:00 PM - 10:00:00 PM	Late shift	60.968	16.16	166,200.5	3.94	41,382.0	0.00	20.10
8/2/2024	6:00:00 AM - 2:00:00 PM	Early shift	75.602	20.03	163,860.2	3.89	40,505.0	0.00	23.92
8/2/2024	2:00:00 PM - 10:00:00 PM	Late shift	74.995	19.95	168,732.5	4.00	42,283.0	0.00	23.88

LHEnergyInfo – entry page



Choose between the following display options “workpiece energy consumption” or “machine energy consumption”

LHEnergyInfo

The screenshot displays the LHEnergyInfo web platform interface. At the top, there is a navigation bar with the LHEnergyInfo logo and menu items: LHMachinelInfo, LHSIGNALInfo, LHReportInfo, LHEnergyInfo (selected), Settings, Hello martin.schwarzmann@liebherr.com!, and Log out. The main content area is titled "Workpiece energy consumption" and features a list of workpieces on the left and a data table on the right.

Workpiece energy consumption

W-Proberad-M4,5-Z47-DB, LC280DC / FN5618, 63

- 2001-D030773-02, LK500, 93
- 2883171-VZ11, LS300F, 52
- AKW-15 Spannzange, LK500, 86
- AKW-15 Spannzange 7 Schnitte, LS300F, 180
- AKW 15 Spannzange links, LK180, 93
- AST, LK280DC, 119
- Außenverzahnung, LS300F, 50
- Beladetest 4x 25kg, LK280DC, 87
- Einfaedeln, LS180E, 81
- EZ-02-163-008-E, LGG280, 100
- EZ-02-163-008-E Vz1 + Bohren 2, LC280DC, 147
- EZ-02-163-008-E Vz1/Vz2+ Bohren, LC2000, 124

	Electrical energy	Compressed air	Coolant	Total
Consumption	0.312 kWh	28.2 l	0.0 l	
Costs	0.08 €	0.00 €	0.00 €	0.08 €
CO₂ Emissions	119 g	1 g	0 g	120 g

Program runtime: 00:01:49
(Average values of all 63 manufactured parts)

[List of produced workpieces of this program](#)



Select the respective workpiece which you want to analyze

LHEnergyInfo – Workpiece list with energy costs

LHWebPlatform LHMachInfo LHSignalInfo LHReportInfo **LHEnergyInfo** Settings Hello martin.schwarzmann@liebherr.com! Log out

Workpiece list energy costs

EZ-02-163-008-E Vz1 + Bohren 2

From: 07/29/2024 To: 08/05/2024

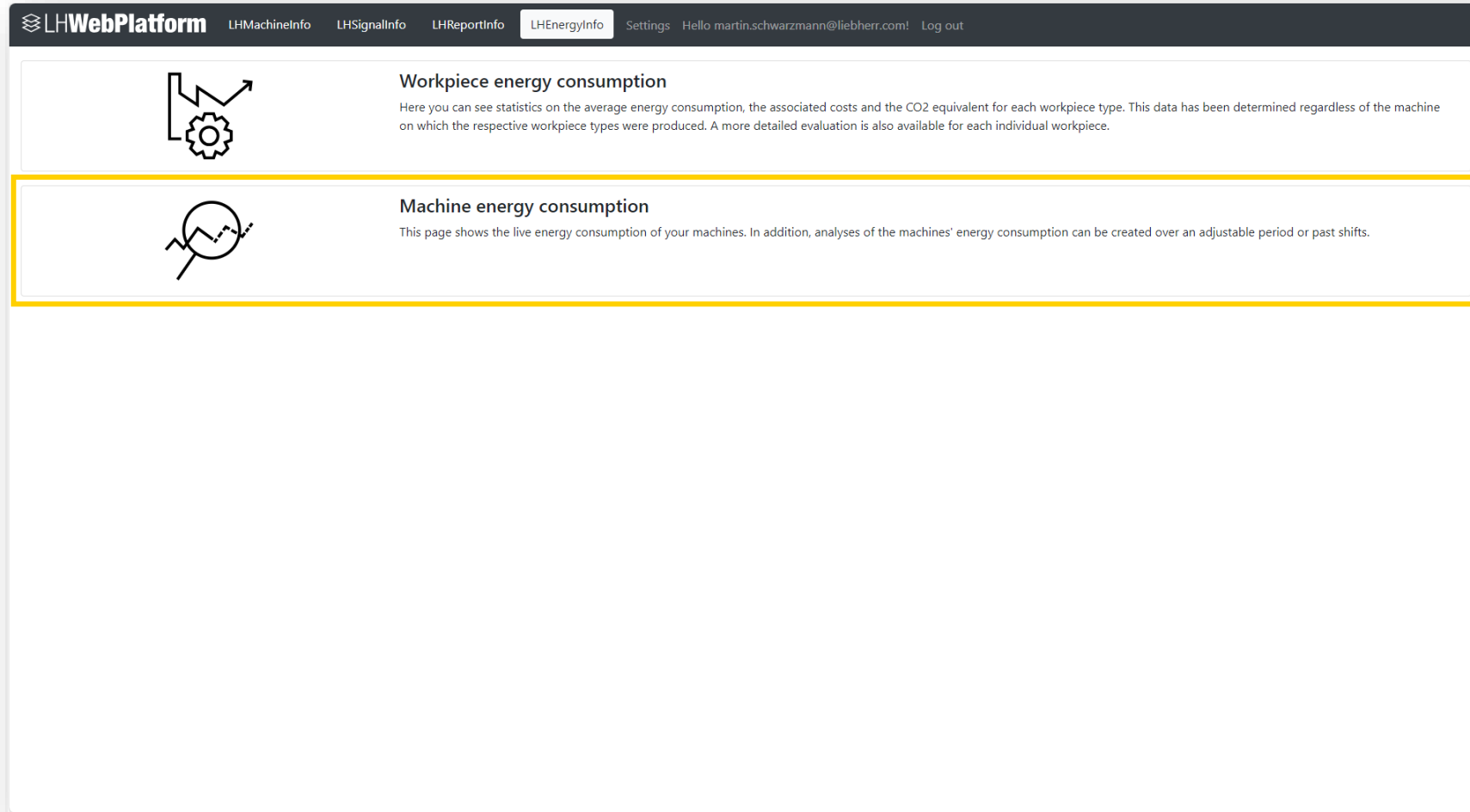
Machine	Date	Start - End	Runtime	Identifier								
LC280DC	8/1/2024	6:21:13 AM - 6:26:37 AM	00:05:24		0.715 kWh	0.19 €	1,975.4 l	0.05 €	502.3 l	0.00 €	348 g	0.24 €
LC280DC	8/1/2024	6:37:30 AM - 6:42:55 AM	00:05:24		0.712 kWh	0.19 €	1,982.6 l	0.05 €	493.8 l	0.00 €	347 g	0.24 €
LC280DC	8/1/2024	6:43:27 AM - 6:44:30 AM	00:01:02		0.152 kWh	0.04 €	377.6 l	0.01 €	95.6 l	0.00 €	72 g	0.05 €
LC280DC	8/1/2024	6:44:57 AM - 6:50:20 AM	00:05:22		0.735 kWh	0.19 €	1,971.1 l	0.05 €	499.0 l	0.00 €	355 g	0.24 €
LC280DC	8/1/2024	6:50:56 AM - 6:56:20 AM	00:05:24		0.767 kWh	0.20 €	1,976.1 l	0.05 €	500.5 l	0.00 €	367 g	0.25 €
LC280DC	8/1/2024	6:56:58 AM - 7:02:22 AM	00:05:24		0.710 kWh	0.19 €	1,987.8 l	0.05 €	510.8 l	0.00 €	346 g	0.24 €
LC280DC	8/1/2024	7:02:59 AM - 7:08:22 AM	00:05:23		0.724 kWh	0.19 €	1,955.0 l	0.05 €	492.3 l	0.00 €	350 g	0.24 €
LC280DC	8/1/2024	7:08:49 AM - 7:14:13 AM	00:05:24		0.719 kWh	0.19 €	1,981.2 l	0.05 €	493.2 l	0.00 €	350 g	0.24 €
LC280DC	8/1/2024	7:14:31 AM - 7:19:54 AM	00:05:22		0.720 kWh	0.19 €	1,962.6 l	0.05 €	505.7 l	0.00 €	349 g	0.24 €
LC280DC	8/1/2024	7:20:36 AM - 7:26:03 AM	00:05:26		0.755 kWh	0.20 €	1,989.2 l	0.05 €	489.4 l	0.00 €	363 g	0.25 €

10 1 2 3 4 5 6 7 8 9 10 ... > >>



You can see in detail the consumption and costs per workpiece at a glance.

LHEnergyInfo – entry page



Choose between the following display options “workpiece energy consumption” or “machine energy consumption”

LHEnergyInfo – Machine Energy Consumption

The screenshot displays the LHEnergyInfo web interface. At the top, there is a navigation bar with 'LHWebPlatform' and several menu items: 'LHMachineInfo', 'LHSignalInfo', 'LHReportInfo', and 'LHEnergyInfo'. The user is logged in as 'Hello martin.schwarzmann@liebherr.com!' and can click 'Log out' or 'Settings'.

The main content area is divided into several sections:

- Machine Identification:** 'LC280DC / FN5618' and 'Versuch' (Trial) with a small image of the machine.
- Workpiece Information:** 'Workpiece name: W-TOFFAC-191084', 'Program name: _N_Fraesen_MPF', and 'Parts: 65'. There are 'Jog' and 'Auto' buttons.
- Energy Consumption Summary:** Three blue buttons: 'Daily energy consumption', 'Energy consumption heat map', and 'Period/shift energy consumption'.
- Electrical energy consumption:** A section with a lightning bolt icon. It lists 'Live' and 'Total' values for Apparent power, Effective power, Reactive power, and Power factor $\cos(\Phi)$.

Category	Value
Apparent power	2.883 kVA
Effective power	2.796 kW
Reactive power	0.003 kVAr
Power factor $\cos(\Phi)$	0.97
- Compressed air consumption:** A section with a compressed air icon. It lists 'Live volume flow' and 'Total volume'.

Category	Value
Live volume flow	66 l/min
Total volume	1,583,593.4 l
- Coolant consumption:** A section with a coolant icon. It lists 'Live volume flow' and 'Total volume'.

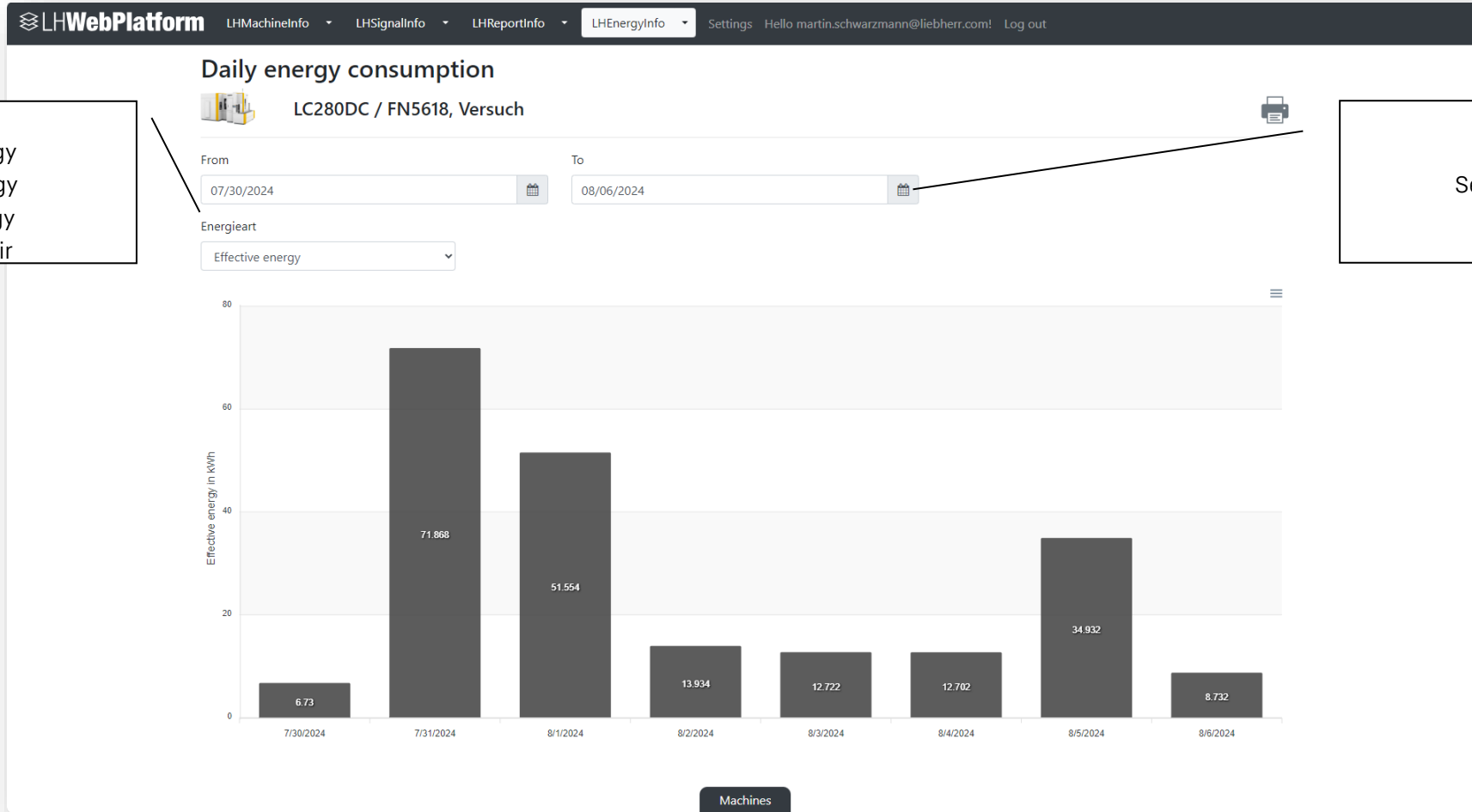
Category	Value
Live volume flow	0 l/min
Total volume	0 l
- Disclaimer:** A box containing the text: '*Please note this machine was executed for dry cutting'.

At the bottom of the interface, there is a 'Machines' button.



see the live consumption and the total consumption at a glance

LHEnergyInfo – Daily Consumption



Select between:

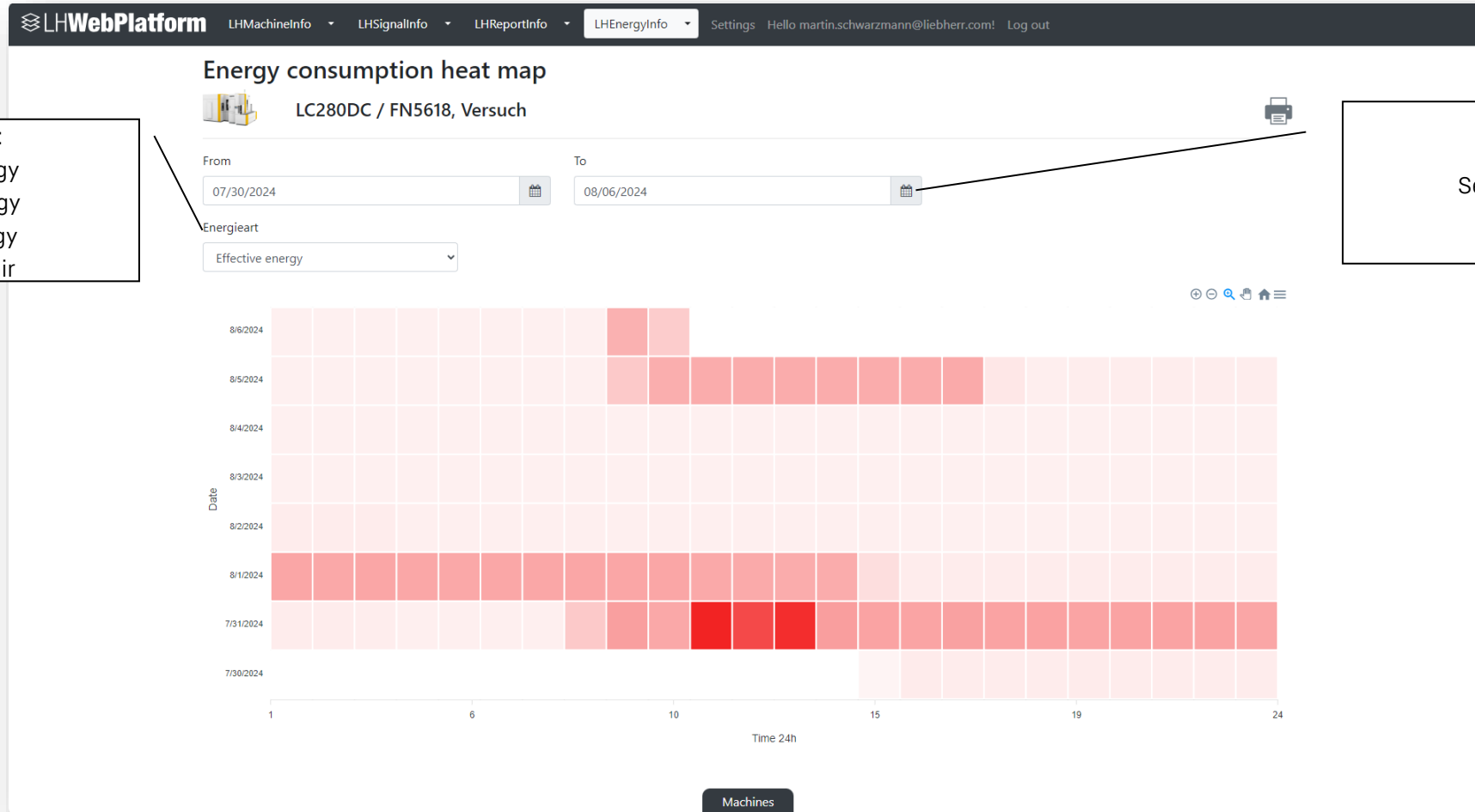
- Effective energy
- Apparent energy
- Reactive energy
- Compressed air

Set the time periods



see the consumption for a specific period what you select

LHEnergyInfo – Consumption heat map



Select between:

- Effective energy
- Apparent energy
- Reactive energy
- Compressed air

Set the time periods







see the consumption for a specific period visualized with a heat map

LHEnergyInfo – Period / shift energy consumption


LHWebPlatform LHMachInfo LHSigInfo LHReportInfo **LHEnergyInfo** Settings Hello martin.schwarzmann@liebherr.com! Log out


Period/shift energy consumption


 LC280DC / FN5618, Versuch 


From: 07/30/2024  To: 08/06/2024 


Energieverbrauch der Maschine im gewählten Zeitraum


 **Electrical energy consumption**

1,248,982.406 kWh
330,980.34 €
474,613,314 g CO₂ 








 **Compressed air consumption**

326,984.4 l
7.76 €
12,592 g CO₂ 

 **Coolant consumption**

0.0 l
0.00 €
0 g CO₂ 

Energieverbrauch Schichten

Date	Start - End	Name							
7/30/2024	2:00:00 PM - 10:00:00 PM	Late shift	1,248,774.290 kWh	330,925.19 €	0.0 l	0.00 €	0.0 l	0.00 €	330,925.19 €
7/31/2024	6:00:00 AM - 2:00:00 PM	Early shift	34.888 kWh	9.25 €	0.0 l	0.00 €	0.0 l	0.00 €	9.25 €
7/31/2024	2:00:00 PM - 10:00:00 PM	Late shift	26.672 kWh	7.07 €	0.0 l	0.00 €	0.0 l	0.00 €	7.07 €
8/1/2024	6:00:00 AM - 2:00:00 PM	Early shift	25.014 kWh	6.63 €	175,767.1 l	4.17 €	0.0 l	0.00 €	10.80 €
8/1/2024	2:00:00 PM - 10:00:00 PM	Late shift	5.990 kWh	1.59 €	35,856.1 l	0.85 €	0.0 l	0.00 €	2.44 €
8/2/2024	6:00:00 AM - 2:00:00 PM	Early shift	4.592 kWh	1.22 €	36,000.0 l	0.85 €	0.0 l	0.00 €	2.07 €
8/2/2024	2:00:00 PM - 10:00:00 PM	Late shift	4.416 kWh	1.17 €	2,630.0 l	0.06 €	0.0 l	0.00 €	1.23 €
8/3/2024	12:00:00 AM - 11:59:59 PM	Whole day	12,714 kWh	3.37 €	0.0 l	0.00 €	0.0 l	0.00 €	3.37 €
8/4/2024	12:00:00 AM - 11:59:59 PM	Whole day	12,692 kWh	3.36 €	0.0 l	0.00 €	0.0 l	0.00 €	3.36 €
8/5/2024	6:00:00 AM - 2:00:00 PM	Early shift	17,994 kWh	77 €	22,367.2 l	0.53 €	0.0 l	0.00 €	5.30 €

Set the time periods



see the consumption for shift comparison

LHEnergyInfo – settings

The screenshot shows the 'Energy consumption settings' page in the LHEnergyInfo web platform. The page is divided into two main sections: 'Unit system' and 'Energy prices and emission factors'. The 'Unit system' section contains five dropdown menus for 'Electrical energy in' (kWh), 'Weight units in' (g), 'Volume units in' (l), 'Time units in' (Minutes), and 'Currency symbol' (€). A green 'Save' button is located below these settings. The 'Energy prices and emission factors' section lists three energy types: 'Electrical energy', 'Compressed air', and 'Coolant'. Each type has a 'Price' and a 'CO₂ emission factor' field. For 'Electrical energy', the price is 0.265 €/kWh and the CO₂ emission factor is 380 g/kWh. For 'Compressed air', the price is 2.37E-05 €/l and the CO₂ emission factor is 0.0385 g/l. For 'Coolant', both the price and CO₂ emission factor are set to 0. A green 'Save' button is located at the bottom of this section.

Energy Type	Price	Unit	CO ₂ Emission Factor	Unit
Electrical energy	0.265	€/kWh	380	g/kWh
Compressed air	2.37E-05	€/l	0.0385	g/l
Coolant	0	€/l	0	g/l



Simple settings of “Unit systems” – Prices for Energy, Compressed Air & Coolant

Deliberately induced compressed air leakage

Compressed air leakage as example

A hole with a diameter of 1 mm was deliberately made

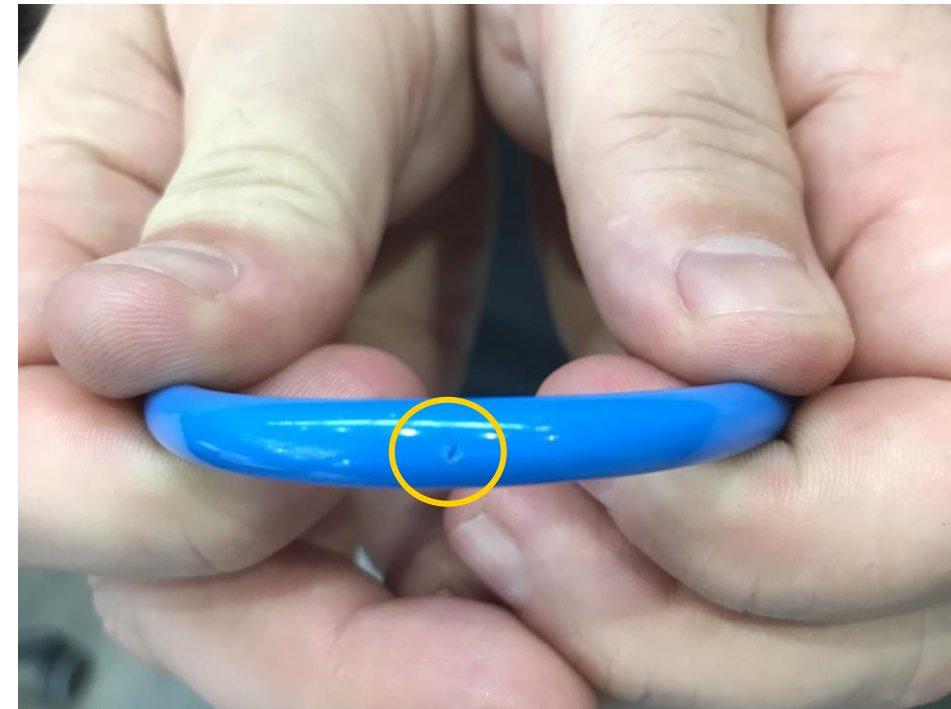
The consumption per minute increased from 60 l/min to 72 l/min

Sample calculation:

$$\frac{\text{additional consumption } l \text{ per min} * 60 \text{ min} * 24 \text{ h} * 365 \text{ days/year}}{\frac{1000 \text{ l}}{m^3}} * \frac{0,023 \text{ €}}{m^3}$$


$$\frac{12 \frac{l}{min} * 60 \text{ min} * 24 \text{ h} * 365 \text{ days/year}}{\frac{1000 \text{ l}}{m^3}} * \frac{0,023 \text{ €}}{m^3} =$$

$$6.307,2 \text{ m}^3 * 0,023 \frac{\text{€}}{\text{m}^3} = \underline{\underline{145,07 \text{ € per year}}}$$

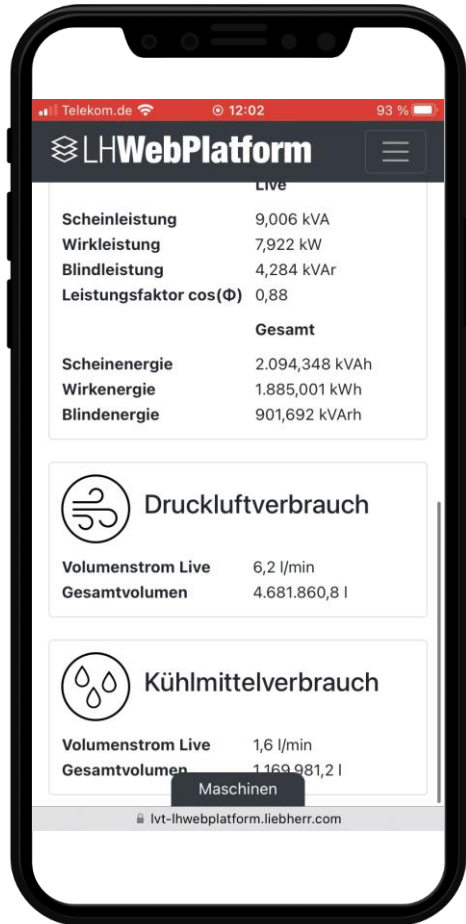


Energy saving potential by process optimization!

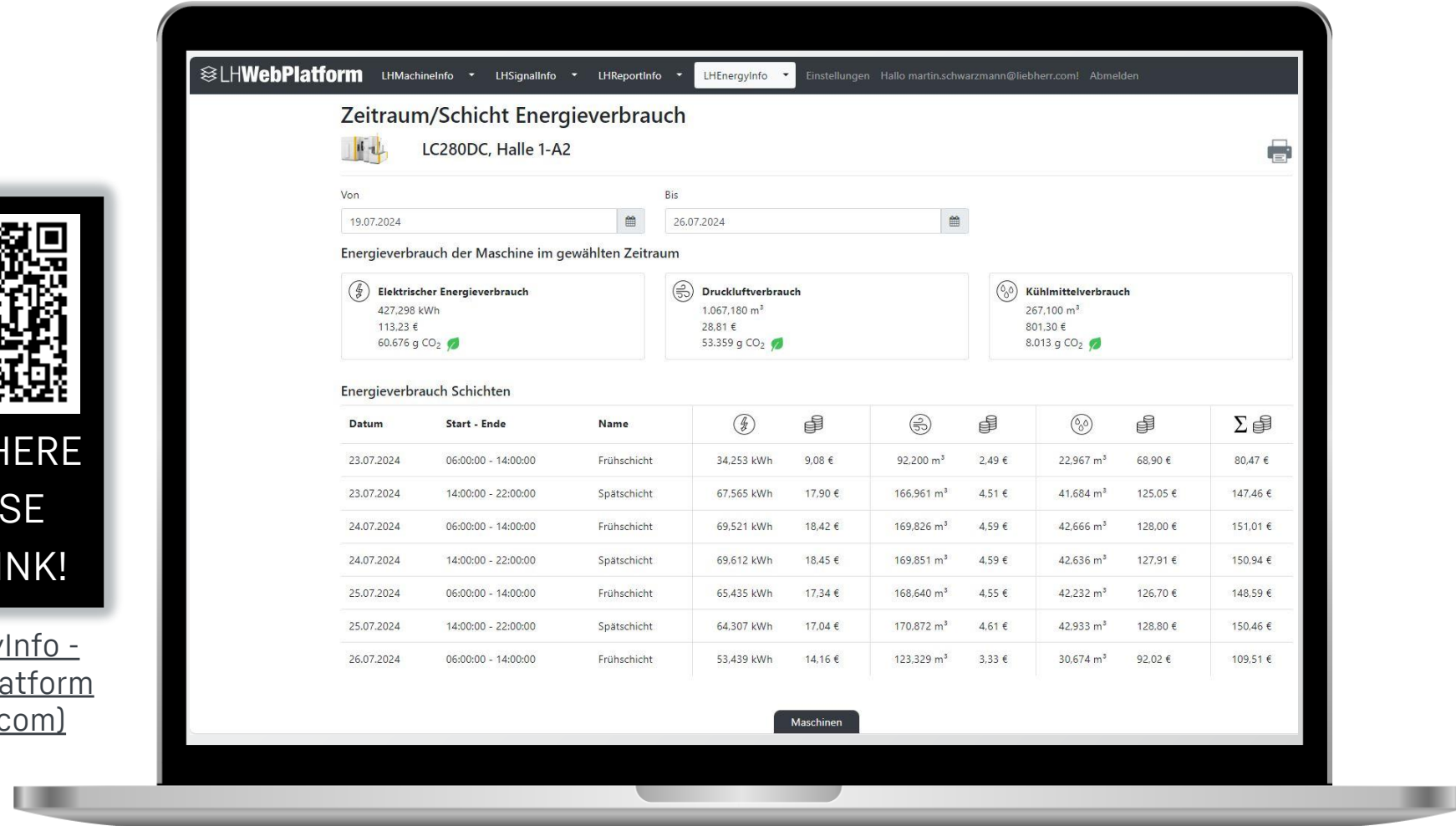
		LHWebPlatform LHMachinelInfo LHSignalInfo LHReportInfo LHEnergyInfo Einstellungen Hallo martin.schwarzmann@liebherr.com! Abmelden												
Serie A Axial Feed $f_a = 3\text{mm}/\text{WR}$	LC280DC / FN5618	07.08.2024	14:31:14 - 14:33:50	00:02:35	0,264 kWh	0,07 €	1.068,6 l	0,03 €	0,0 l	0,00 €	141 g	0,10 €		
	LC280DC / FN5618	07.08.2024	14:33:52 - 14:36:25	00:02:32	0,270 kWh	0,07 €	1.039,0 l	0,02 €	0,0 l	0,00 €	143 g	0,10 €		
	LC280DC / FN5618	07.08.2024	14:36:27 - 14:39:00	00:02:32	0,266 kWh	0,07 €	1.028,9 l	0,02 €	0,0 l	0,00 €	141 g	0,09 €		
	LC280DC / FN5618	07.08.2024	14:39:02 - 14:41:35	00:02:32	0,244 kWh	0,06 €	1.022,5 l	0,02 €	0,0 l	0,00 €	132 g	0,09 €		
Serie B Axial Feed $f_a = 2,4\text{ mm}/\text{WR}$	LC280DC / FN5618	07.08.2024	16:32:38 - 16:35:26	00:02:47	0,290 kWh	0,08 €	1.167,0 l	0,03 €	0,0 l	0,00 €	155 g	0,10 €		
	LC280DC / FN5618	07.08.2024	16:35:28 - 16:38:22	00:02:53	0,296 kWh	0,08 €	1.202,8 l	0,03 €	0,0 l	0,00 €	159 g	0,11 €		
	LC280DC / FN5618	07.08.2024	16:38:25 - 16:41:15	00:02:49	0,258 kWh	0,07 €	1.142,4 l	0,03 €	0,0 l	0,00 €	142 g	0,10 €		
	LC280DC / FN5618	07.08.2024	16:41:17 - 16:44:08	00:02:50	0,258 kWh	0,07 €	1.160,9 l	0,03 €	0,0 l	0,00 €	143 g	0,10 €		
	LC280DC / FN5618	07.08.2024	16:44:11 - 16:47:01	00:02:49	0,256 kWh	0,07 €	1.142,9 l	0,03 €	0,0 l	0,00 €	141 g	0,09 €		
Serie C Axial Feed $f_a = 4,5\text{ mm}/\text{WR}$	LC280DC / FN5618	08.08.2024	09:22:38 - 09:26:21	00:03:43	0,326 kWh	0,09 €	1.615,2 l	0,04 €	0,0 l	0,00 €	186 g	0,12 €		
	LC280DC / FN5618	08.08.2024	09:35:55 - 09:41:03	00:05:07	0,386 kWh	0,10 €	1.153,4 l	0,03 €	0,0 l	0,00 €	191 g	0,13 €		
	LC280DC / FN5618	08.08.2024	10:10:00 - 10:12:07	00:02:06	0,206 kWh	0,05 €	860,1 l	0,02 €	0,0 l	0,00 €	111 g	0,08 €		
	LC280DC / FN5618	08.08.2024	10:12:10 - 10:14:23	00:02:13	0,216 kWh	0,06 €	896,5 l	0,02 €	0,0 l	0,00 €	117 g	0,08 €		
	LC280DC / FN5618	08.08.2024	10:14:26 - 10:16:37	00:02:10	0,210 kWh	0,06 €	858,1 l	0,02 €	0,0 l	0,00 €	113 g	0,08 €		
	LC280DC / FN5618	08.08.2024	10:16:40 - 10:18:51	00:02:10	0,214 kWh	0,06 €	869,8 l	0,02 €	0,0 l	0,00 €	115 g	0,08 €		
	LC280DC / FN5618	08.08.2024	10:18:53 - 10:21:04	00:02:11	0,212 kWh	0,06 €	872,8 l	0,02 €	0,0 l	0,00 €	114 g	0,08 €		

 In the C series, ~ 1-2 cents of energy could be saved per workpiece - with 1,000,000 workpieces per year, this corresponds to €10,000 saving potential!

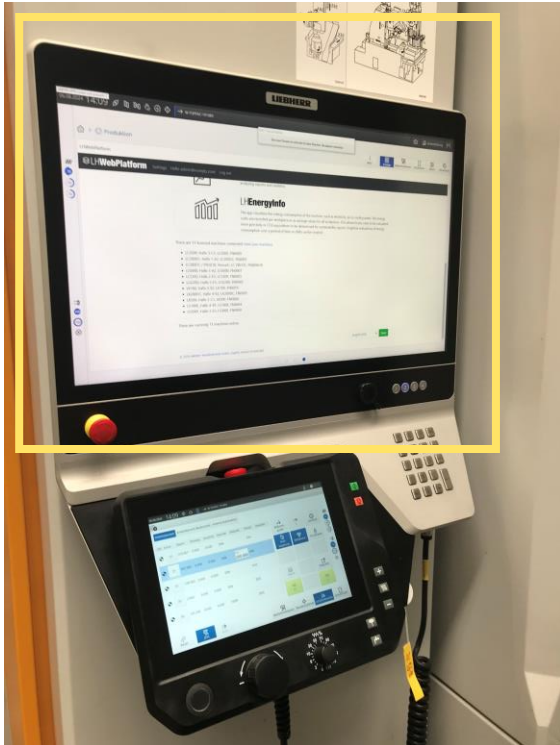
LHEnergyInfo – Convince yourself in our Demo Version!



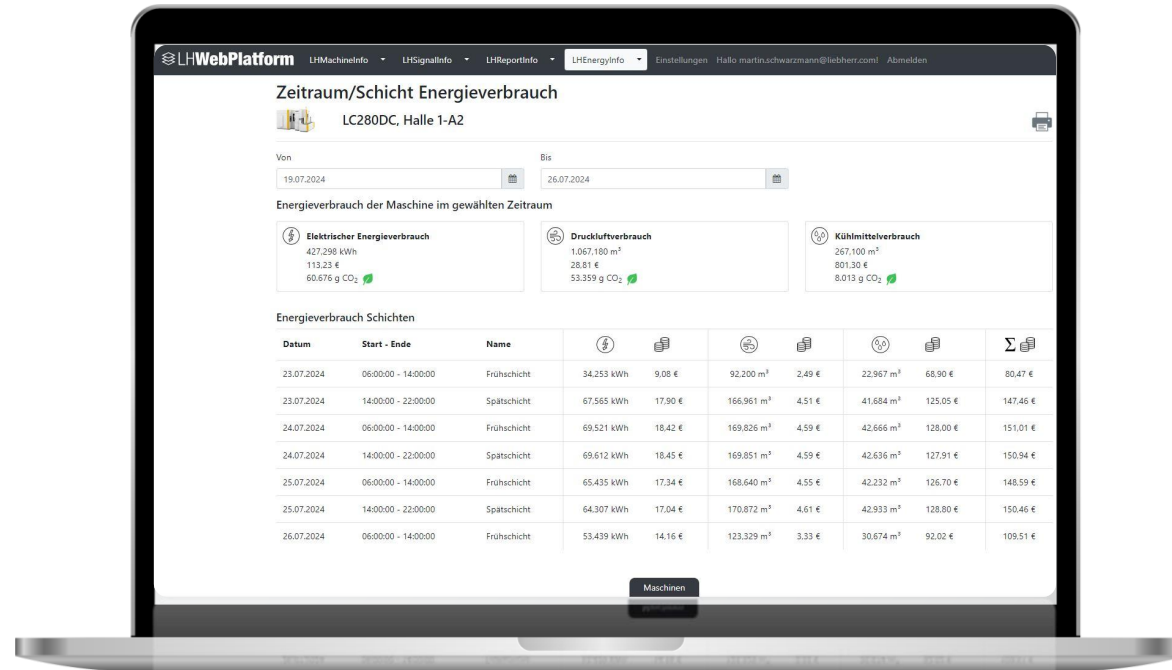
[LHEnergyInfo - LHWebPlattform \(liebherr.com\)](#)



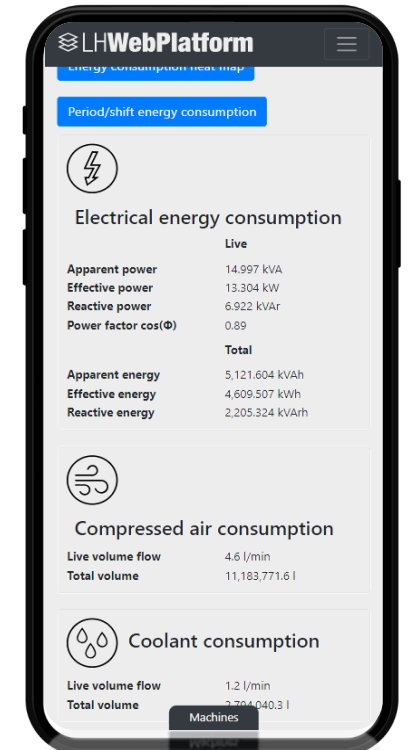
LHEnergyInfo can be displayed



– Machine Control
LHStation & LHMobile



– Desktop devices



– Mobile devices

**Thank
you**

