Energy Efficiency with Refrigeration Compressor

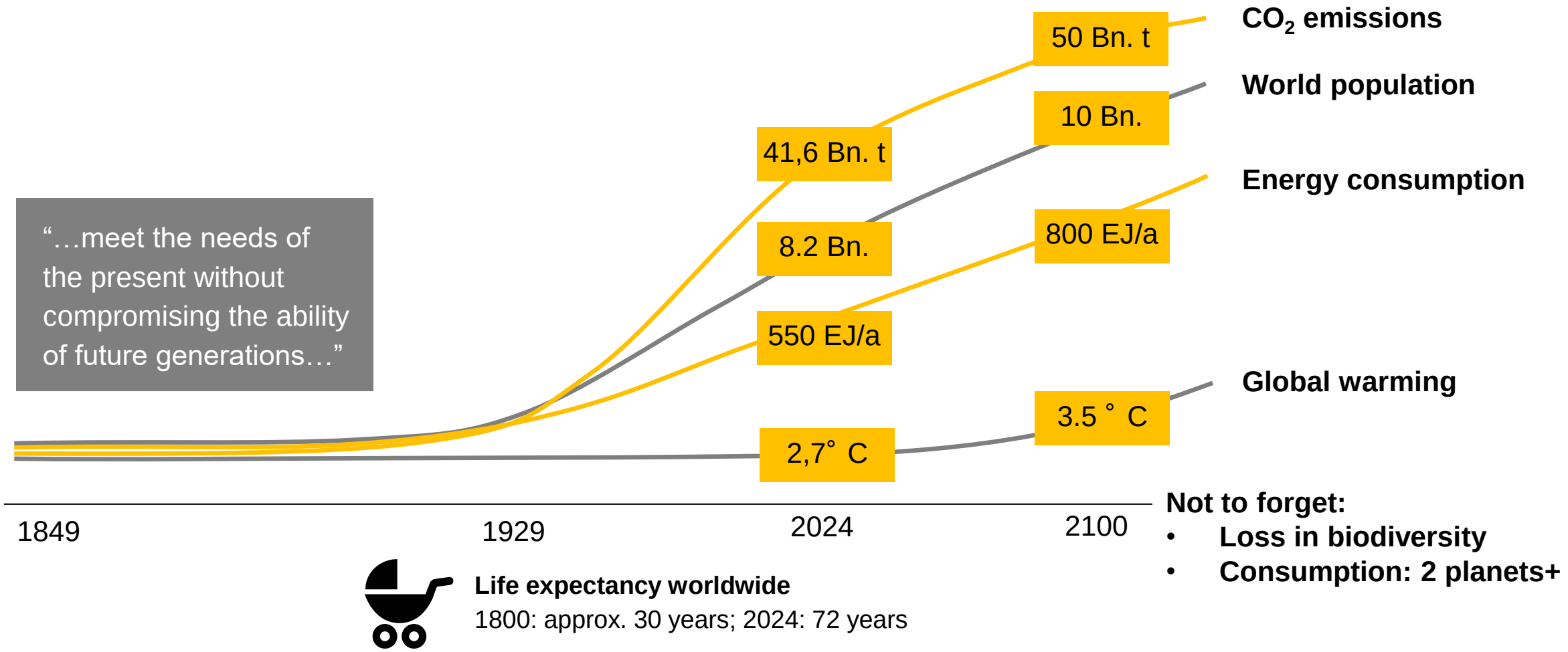
KLÜBER LUBRICATION

a brand of FREUDENBERG

Which side do you prefer?

Why sustainability ?

We are facing a global challenge



"…meet the needs of the present without compromising the ability of future generations…"

Not to forget:

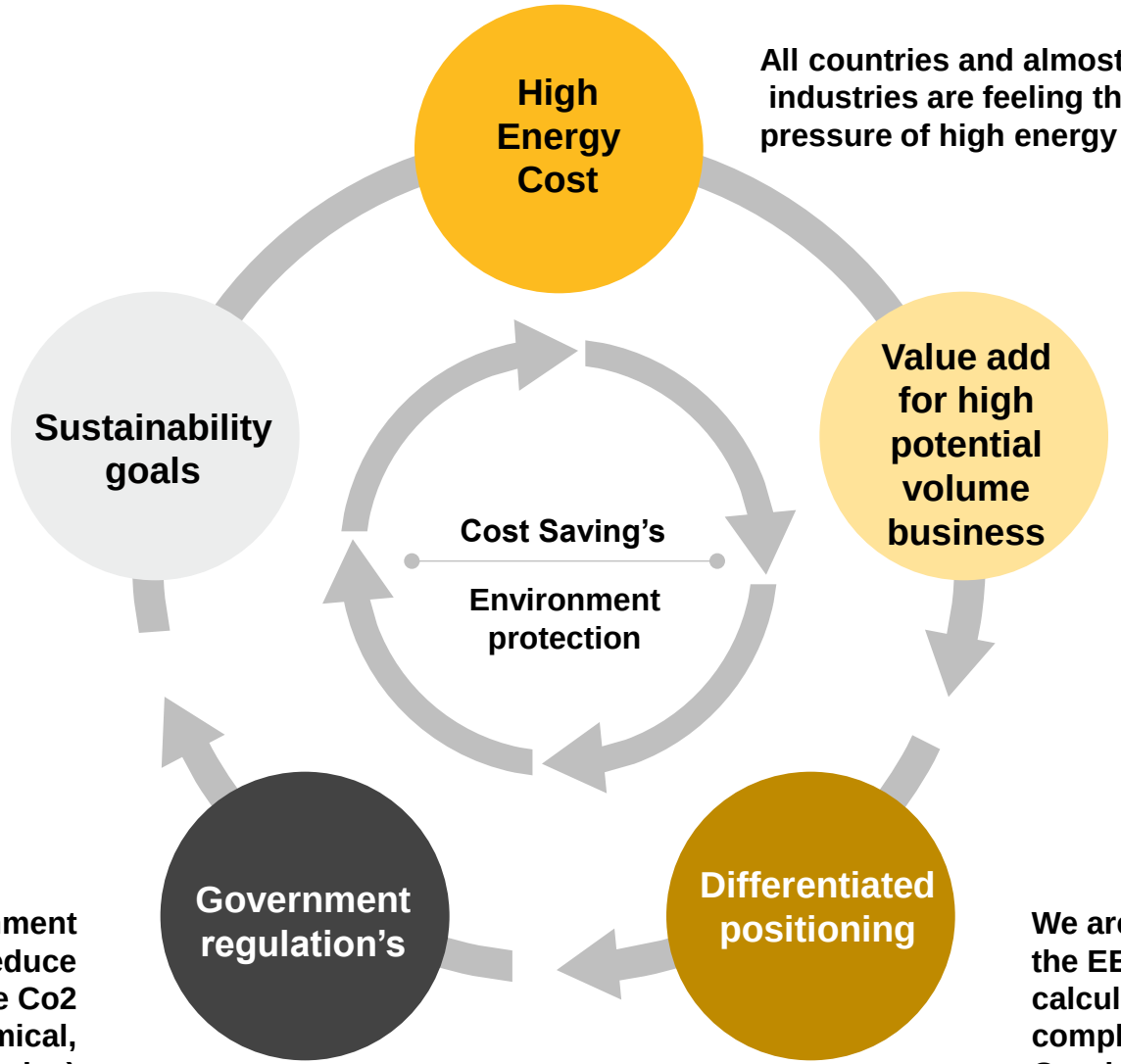
- **Loss in biodiversity**
- **Consumption: 2 planets+**

Life expectancy worldwide

1800: approx. 30 years; 2024: 72 years

KLÜBER LUBRICATION

Why should you focus energy efficiency with Klüber Lubrication?



All countries and almost all industries are feeling the pressure of high energy cost.

In high volume gearbox and compressor business, EE can be good value add for customers to change.

We are transparent in offering the EE services. We make calculations according to compliance with ISO 50001. Good chance to differentiate

In many countries, government is building pressure to reduce energy consumption and the Co2 emissions(Specially in Chemical, Food and heavy industries)

Many global companies have committed publicly about reducing their Co2 footprint.

The challenges of operating refrigeration compressors
Operators face huge costs

Typical cost drivers

- ***Energy***
  - Compressors cause up to 60% of the total energy consumption of plants manufacturing frozzen products

- ***Maintenance***
  - Oil change period not longer than 6.000 hours on average
  - Costs for changing the oil filters
  - High need for topping-up, about 10% of the volume per month

KlüberEnergy a service to tackle the global energy challenge

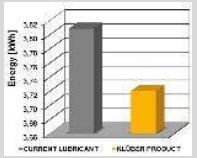
A comprehensive package to harness Energy efficiency from specialty lubricants

KlüberEnergy

Energy Efficiency

Services for optimum energy efficiency of your lubricant application.
Reports on concrete savings.

- Energy consulting (tribo-system)
- Energy measurements
- Energy Analysis
- Reporting (energy + cost savings)

	**Energy consulting**	**Evaluation of equipment and report on energy savings potential**	**Find out which of your equipment has a real potential for energy reduction**
	Energy Measurements*	Professional measurement of all relevant influencing factors before and after application optimization	Maximize efficiency in measurement to avoid retrials
	Energy analysis*	Analysis of measurement data	Provide complete transparency regarding savings and energy consumption with a high level of confidence
	Reporting*	Translation of analysis results into relevant key figures	Clear and simple reporting of relevant values, e.g. cost savings, CO_2 emissions, ROI, energy consumption

*** First preference would be to work with control room data. If not go for EE measurement onsite**

Others claim – we prove!

We follow international standards

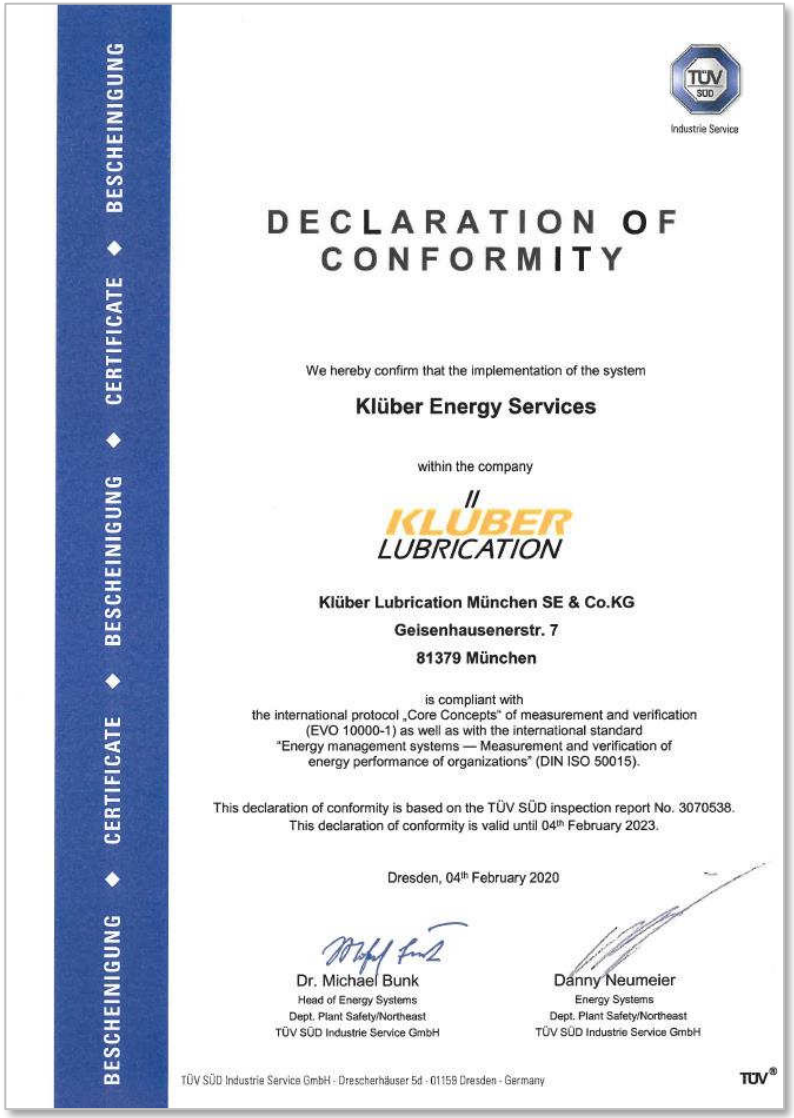
We can carry out projects fully compliant with international recognized standards such as

- International Performance Measurement and Verification Protocol (IPMVP)
- DIN ISO 50015

Benefits for you:

+ Professional project process
+ Full transparency on what and how we do it
+ Assurance that results are reliable
+ Usability of project reports in your ISO 50001 Audit

ISO 50001
ENERGY MANAGEMENT


BESCHEINIGUNG ◆ CERTIFICATE ◆ BESCHEINIGUNG ◆ CERTIFICATE ◆ BESCHEINIGUNG

TÜV SÜD Industrie Service

DECLARATION OF CONFORMITY

We hereby confirm that the implementation of the system

Klüber Energy Services

within the company

KLÜBER LUBRICATION

Klüber Lubrication München SE & Co.KG
Geisenhausenerstr. 7
81379 München

is compliant with
the international protocol „Core Concepts" of measurement and verification (EVO 10000-1) as well as with the international standard "Energy management systems — Measurement and verification of energy performance of organizations" (DIN ISO 50015).

This declaration of conformity is based on the TÜV SÜD inspection report No. 3070538.
This declaration of conformity is valid until 04th February 2023.

Dresden, 04th February 2020

Dr. Michael Bunk
Head of Energy Systems
Dept. Plant Safety/Northeast
TÜV SÜD Industrie Service GmbH

Danny Neumeier
Energy Systems
Dept. Plant Safety/Northeast
TÜV SÜD Industrie Service GmbH

TÜV SÜD Industrie Service GmbH - Dresdner Häuser 5d - 01159 Dresden - Germany

TÜV®

KLÜBER LUBRICATION

Klüber Energy Efficiency benefits

Experience from the field - We have proven the concept multiple times

Successful measurement projects with refrigeration compressors have resulted in:

- Average savings: 5 %
- Average payback time: 5 months

Important: prior use of Klüber Summit Varnasolv

Application	Average power [kW]	Operating time [hours per year]	Oil volume [litres]	Payback time [years]	Measured savings [%]
Refrigeration compressor	1200	8000	1000	0.5	6.20
Refrigeration compressor	400	7500	400	0.4	6.50
Refrigeration compressor	380	7500	250	0.3	4.20
Refrigeration compressor	350	8600	340	0.8	6.70
Refrigeration compressor	350	7000	208	0.3	3.30
Refrigeration compressor	350	7000	208	0.3	3.30
Refrigeration compressor	350	7500	400	0.5	7.10
Refrigeration compressor	350	8000	340	0.8	6.70
Refrigeration compressor	350	7500	240	0.4	6.10
Refrigeration compressor	350	8000	340	0.8	6.70

KL success story in refrigeration

# of compressors switched to

- R 200 → 310 compressors
- RHT 68 → 61 compressors

# of plants switched to

- R 200 → 77 plants
- RHT 68 → 61 plants

Excellence for customers

References

JBS, BRF, Cargill, Marfrig → meat processing

Coca Cola, Heinecken, Cutrale → beverage

Lactalis → diary

Replaced

- Mobil Gargoyle Arctic series
- PetroCanada Reflo 68 A
- CPI 1009-68
- PetroBras oils
- OEM rebrands

Possible Methodologies

There are 2 Available Methods

1- METHODOLOGY 1: Load Estimation

- **Use of Power Analyzer Device- RMS (i.e.: Fluke device), data from electric motor.**
- **Variables to read**
  - Time *)
  - Active power (kW)
  - Power Factor

  *): Register data every 1 minute (average value for each interval).
- **Estimated Variable:**
  - Calculated load in %
- **Point of device Installation : Electric Cabinet (motor).**

+ **Easy** to insert and manage

Recommendable for stable working condition

- An external device is need

2- METHODOLOGY 2: Load calculation

- **Use of Data Logger, data from the compressor**
- **Variables**
  - Time *)
  - Active Power (kW). (also load %)
  - Temperature & Pressure at suction
  - Temperature & Pressure at Discharge

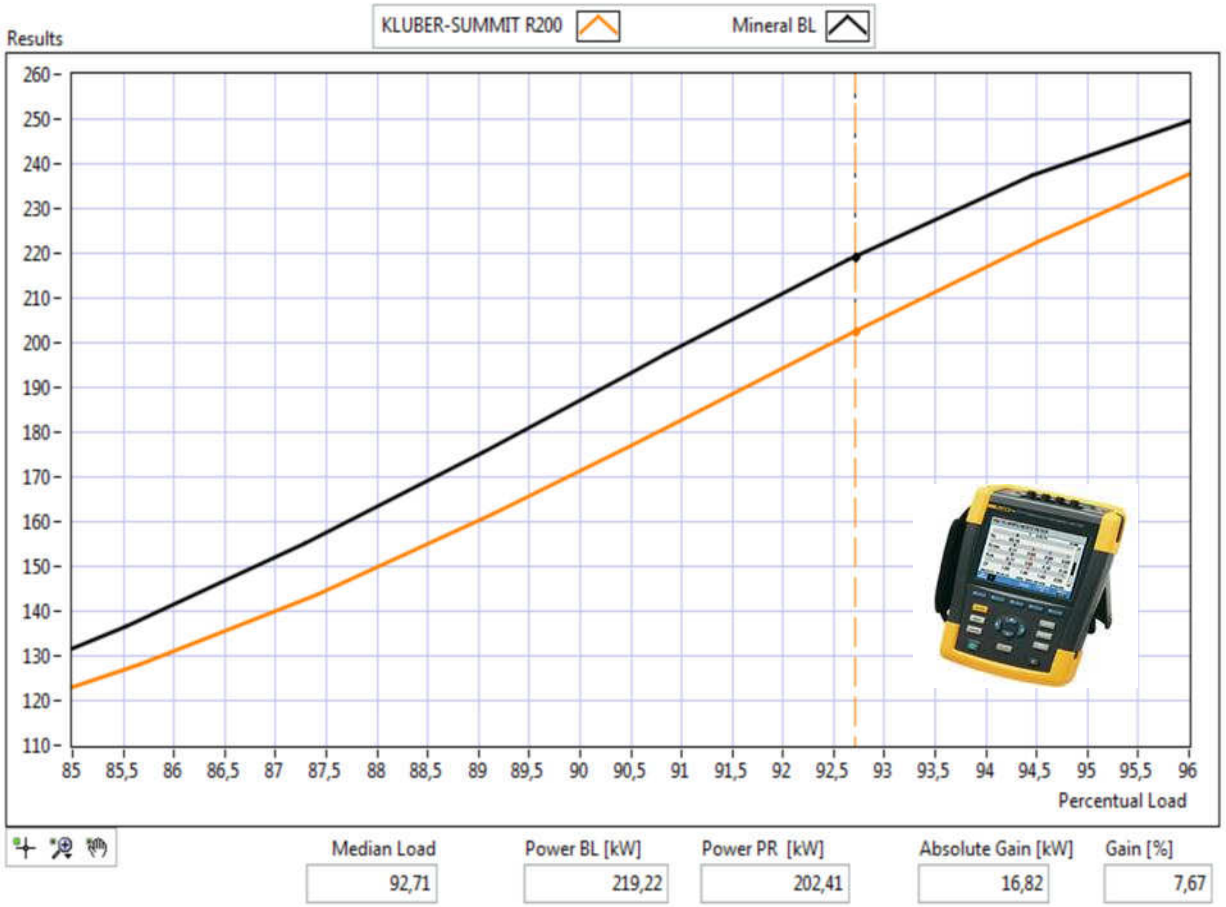
- **Calculated Variable:**
  - Calculated load in %
- **Point of Installation : Sensors of Compressor (behind main compressor display)**

+ **Higher accuracy**

Recommendable with more variable working condition

- An external device is need

Klüber Energy Efficiency Metodology



Knowing the Power Factor from the motor, we can get the load of the compressor load (in %) at any moment and matching it with the real KWh demanded.

We focus on data when compressor was working preferently, and showed the data on a load percentage scale.

By switching from mineral oil to Klüuber Summit R-200, it showed quite similar saving for typical working load conditions (from 85 to 97%)

(oil cleanness is key for getting good value. If we know that compressor is dirty of oil residue accumulation, Klüber Summit Varnasolv reports relevant contribution)

Methodology 1- Load Estimation

Using just a Power Analyzer

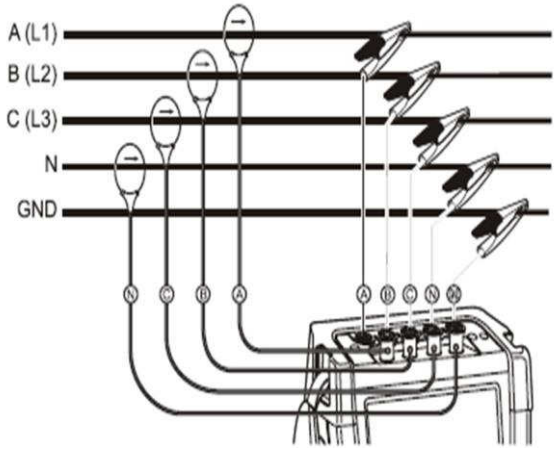
Aspect to consider:

- Ask about possibility of setting the load of the compressor to 95%. With this action we will guaranty that the compressor will be the preference one for operating at the installation and working longer on more stable conditions.

- **Safety –** The Installation of any device and manipulation on the Electrical cabinet must be made by Electrician of Customer, never by a Klüber salesperson!

Just deliver the power analyzer to customer and ask him/her to connect to the electrical motor that drives the compressor.

- Check batteries or plugged to power charger.
- Device has got enough memory room for recording.
- Connect the 5 clamps to motor voltage.
- Connect the 3 rings for ampere/current.
- Check that values are been showed at screen.
- Start recording mode.



Procedure to Change Oil using Klüber Summit Varnasolv

Conditioning Product: Klüber Summit Varnasolv

Purpose : Dissolve and suspend carbon residues formed over time due the use of mineral-based product. Designed to be used as an additive in a 10% concentration in relation to the volume of the lubricant for a period 48-72 operational hours, before the oil change !

Final Product: Klüber Summit RHT-68/100; Klüber Summit RSB-68 or Klüber Summit R series.

Drain existing oil with next the following quantities of the sump:

For alternative Compressors : 5 %

For screw compressors : 10 %

Add the same removed volume with Klüber Summit Varnasolv

Operate the compressor for approx. 48-72 hours in standard operative working conditions.

Check the pressure gap at oil filter is under acceptable values and operate accordantly.

Then, after this 72 hours, drain completely the oil from all parts of oil circuit(oil cooler, filters, purgers, oil separator, etc.). If this action is made meanwhile oil is still warm, shows better results.

Replace oil filters. Check coalescence filters condition if possible.

Dispose drained oil and substituted filters at right and safe place.

Fill the compressor with new Klüber oil until the determined level. Check again this point after 24 & 48h of operational working.

The oil change procedure is finished .

THANK YOU

Mevlut Karakisla
Global Refrigerating Compressor Oil
Sales Develoment Manager

Mevlut.Karakisla@klueber.com

KLÜBER LUBRICATION

a brand of FREUDENBERG