

References

“Replacement of Geared Variable
Speed Couplings”

SETCON

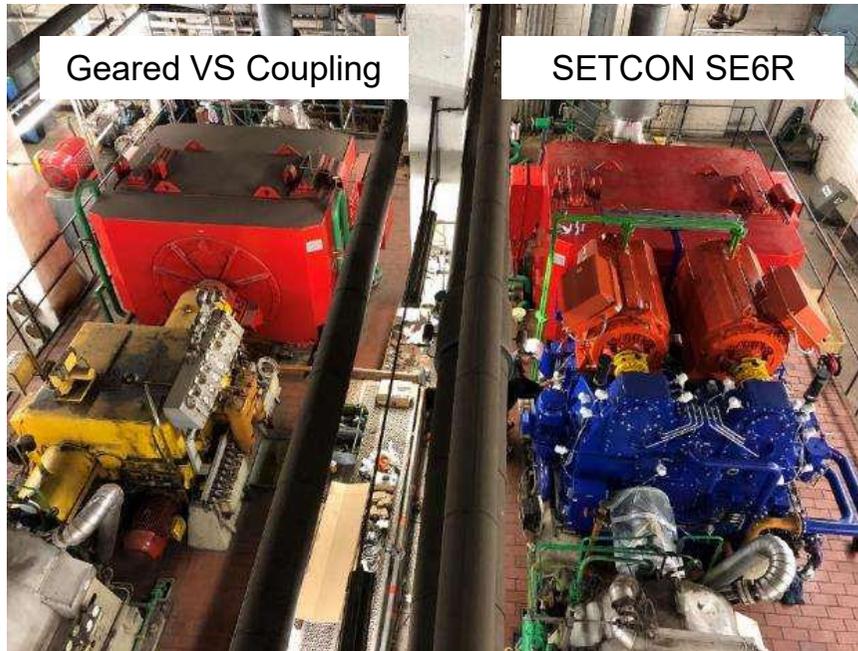
SET^o



SETCON[®] - variable speed gearbox

Retrofit – SETCON SE-R series:

SETCON SE-R and SD series have been designed to **replace** widely spread but inefficient (**geared**) **variable speed couplings**. An optimization of the installation space allows these gearboxes to be replaced without changes to the foundation and the remaining components as oil cooler or constant-speed Main Motor (predominately electrical motors).



The following SETCON models are suitable to replace the following (geared) variable speed coupling types directly:

SD2.5 (1 MW – 2.5 MW)

487 SVTL HP
562 SVTL 12.1
562 SVTL HP
562 SVTL 33
562 SVTL 33 HP
650 SVTL 21.2
650 SVTL 33 HP
750 SVTL 21.2-6.3.2
750 SVTL 22-12.8
866 SVTL 22-12.8
620 SVNL 33 G

SD2.5A (1 MW – 2.5 MW)

464 SVL M
510 SVL M
562 SVL M
620 SVL M
682 SVL M

SE4R (2 MW - 4.4 MW)

R17K...M
R16K...M
R15K...M
R14K...M

SE6R (4.4 MW - 6.6 MW)

R18K...M
R17K...M
R16K...M
R15K...M
R14K...M
R16/17 KGS

SE9R (6.6 MW – 9.9 MW)

R19K...M
R18K...M
R17K...M
R16K...M
R15K...M
R16 - 19 KGS

SE12R (9.9 MW – 13.2 MW)

R19K...M
R18K...M
R17K...M
R16K...M
R 18/19 KGS

SE15R (13.2 MW – 16.5 MW)

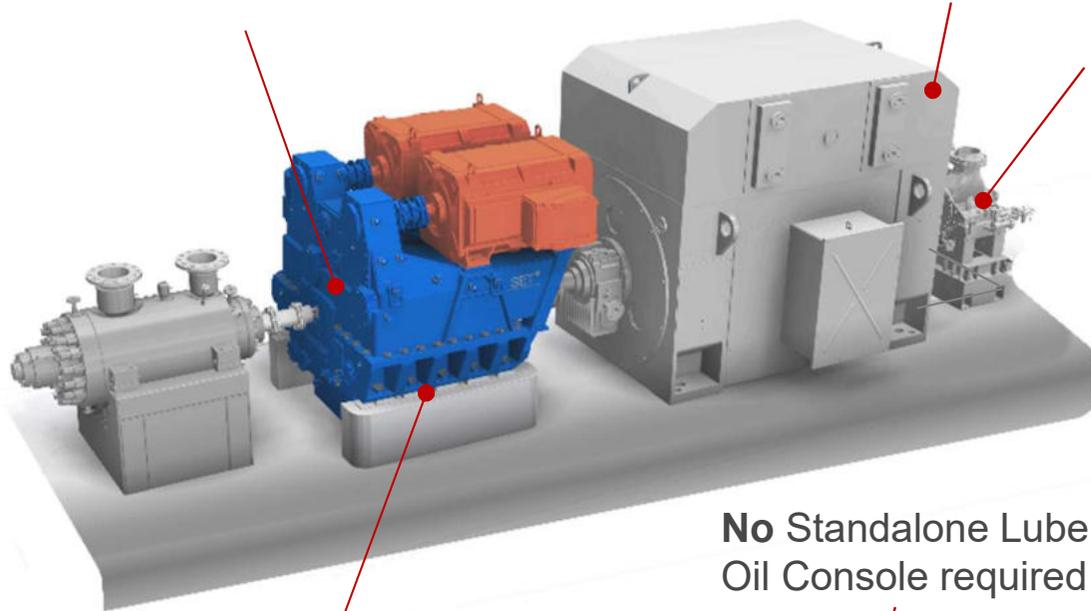
R100 K 630
R19K...M
R18K...M
R17K...M
R 110/111 KGS

Package comparison compared to MV-VFD

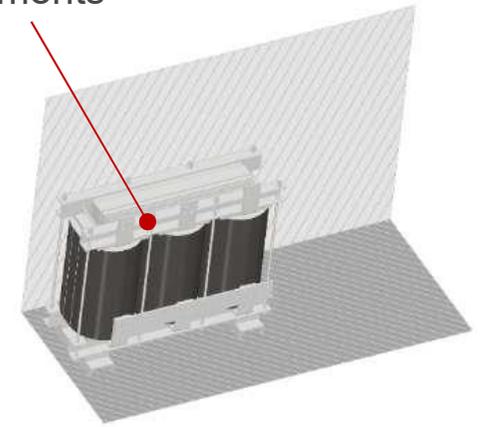
Integrated Lube Oil System with oil supply to external units.

Reuse of **existing Main Motor** (constant speed)

Max. **20%** of Transformer Power (of total driven power) → lower space requirements

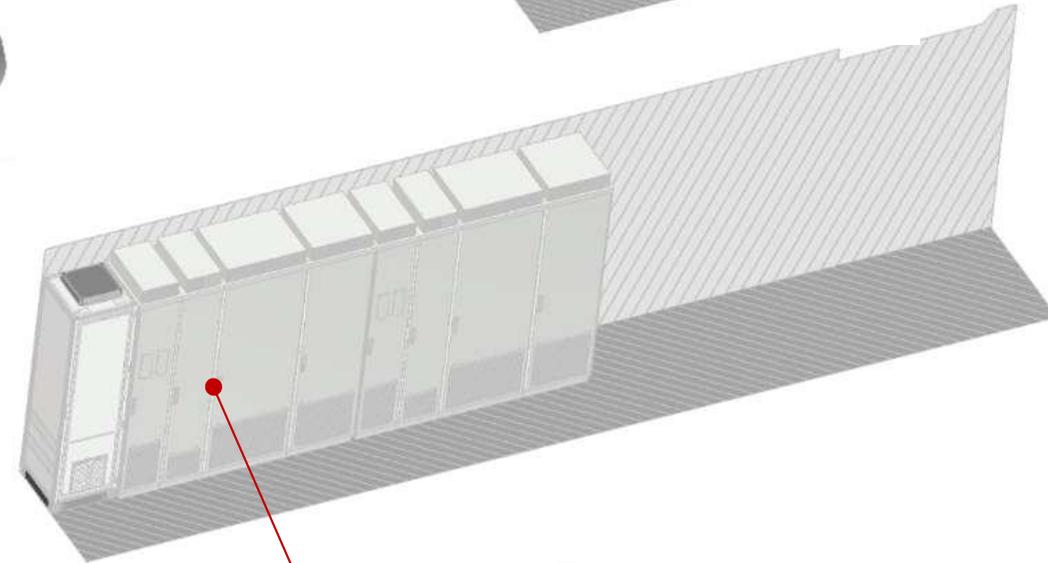
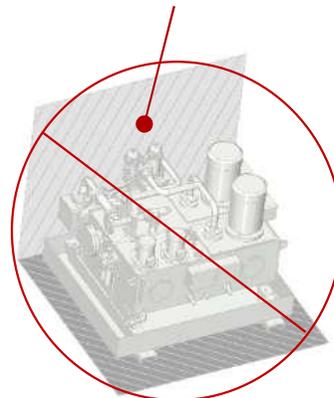


No modification of Booster Pump required, same const. speed input from Main Motor



No Standalone Lube Oil Console required

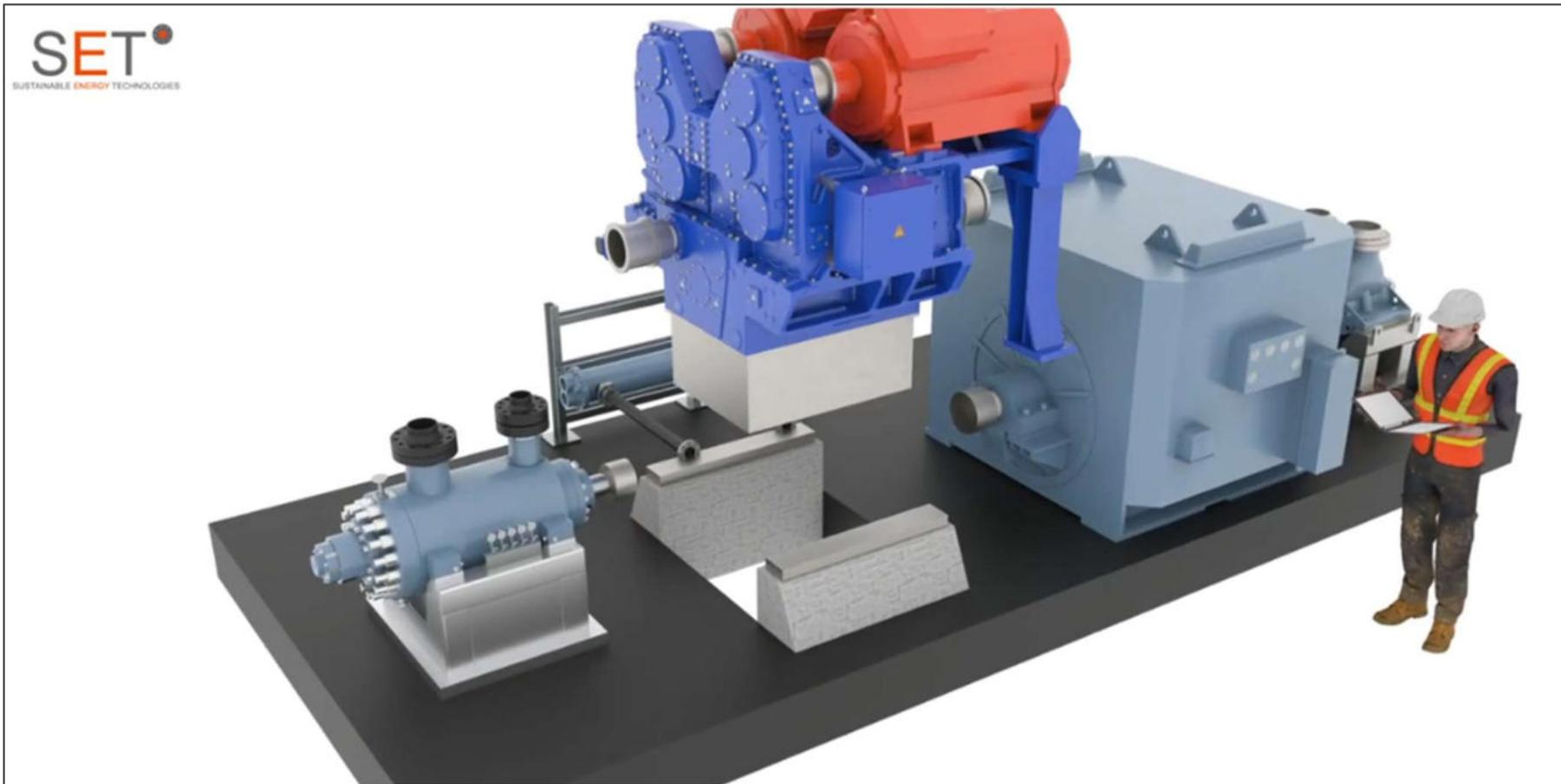
Same footprint and mounting points of most common (geared) variable speed coupling types - customized lube oil piping interfaces



Max. **20%** of Frequency Converter Power (of total driven power) → lower space requirements



SETCON® - Replacement Animation



Youtube: <https://www.youtube.com/watch?v=sRQRZx4RECw>

Replacement of Voith R18K600 (Germany) with SETCON SE6R

Retrofit Project – Overview

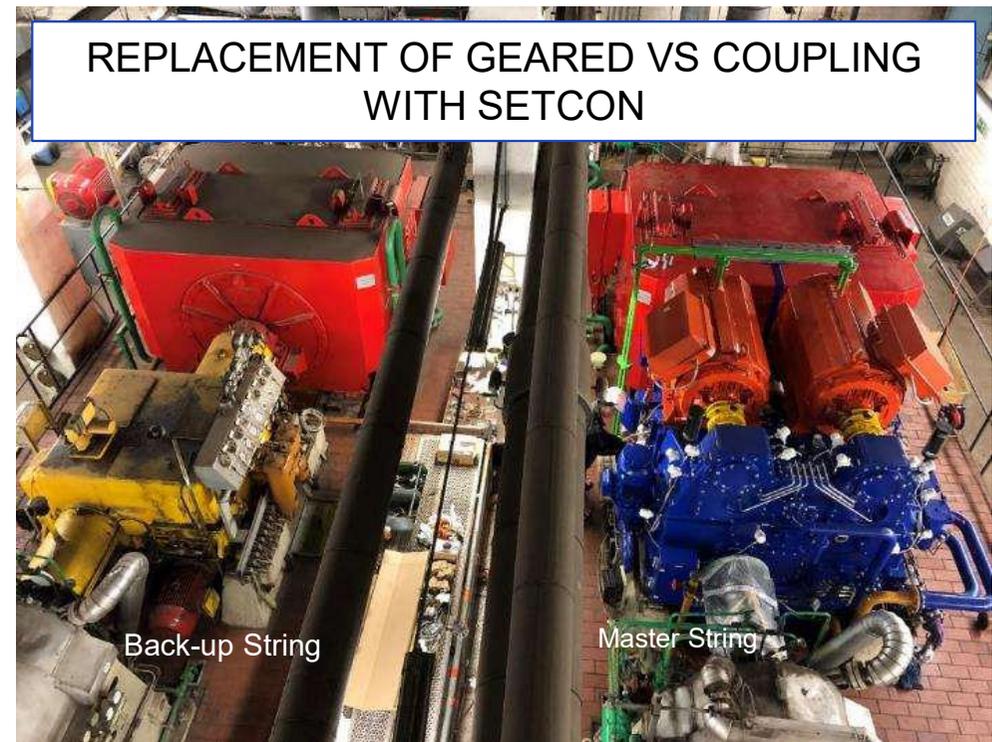
at swb Erzeugung AG - Bremen, Germany



Installation Site	Mittelsbüren Power Plant
Driven Equipment	Boiler Feed Pump
Max. Output Power	6.5 MW
Max. Output Speed	4.500 rpm
Speed Range	50% - 100%
Partial Load Operation	> 80% over the year

Project Goal:

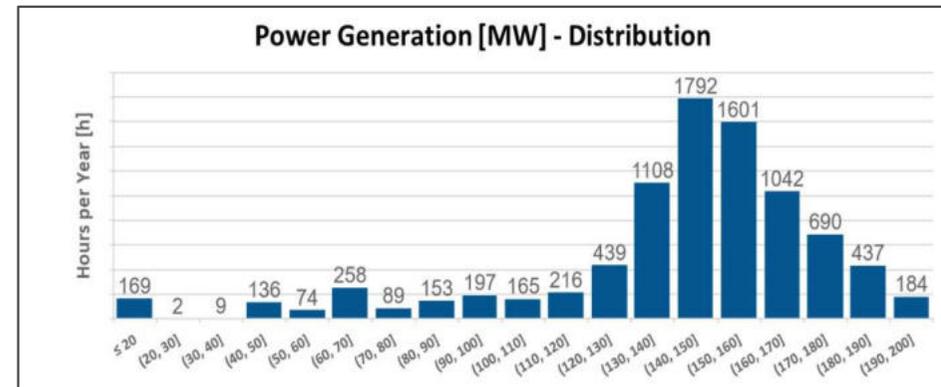
Replacement of Voith R18K600 geared coupling to increase overall energy efficiency of master pump string (no retrofit on back-up string).



Retrofit Project – Guaranteed Savings at swb Erzeugung AG - Bremen, Germany



Boiler Feed Pump with **SETCON® SE6 / 600** – $P_{rated} = 6.070 \text{ kW}$



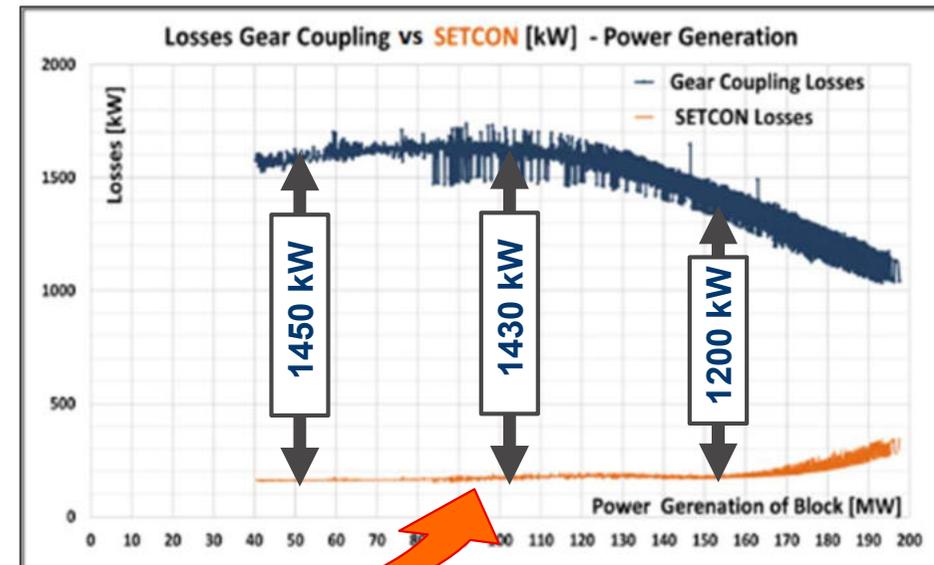
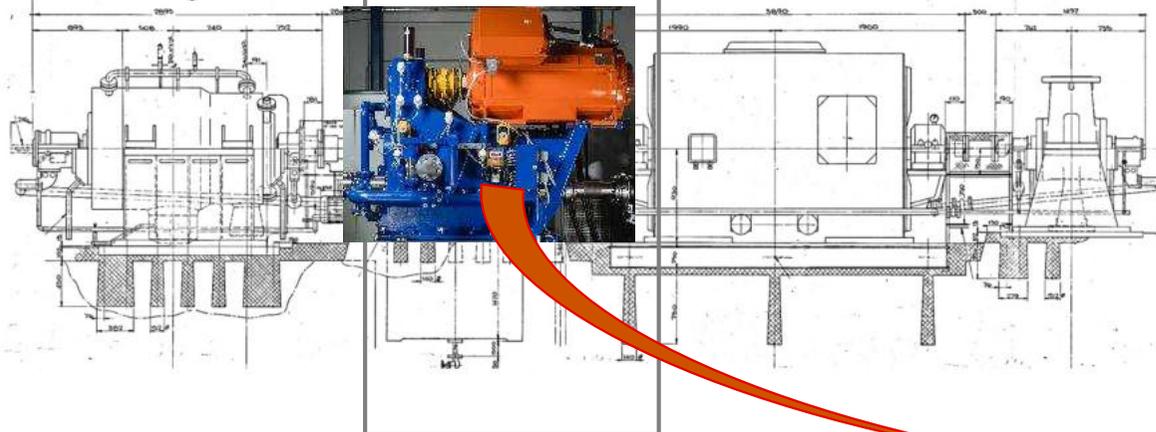
Energy Consumption of drives has been measured before and after SETCON installation.

Boiler Feed Pump

SETCON®

Motor

Booster Pump



Retrofit Project – Exact Footprint at swb Erzeugung AG - Bremen, Germany



Boiler Feed Pump with SETCON® SE6 / 600

Power_{rated}

6.070 kW

Offset = 600 mm

Speed_{rated}

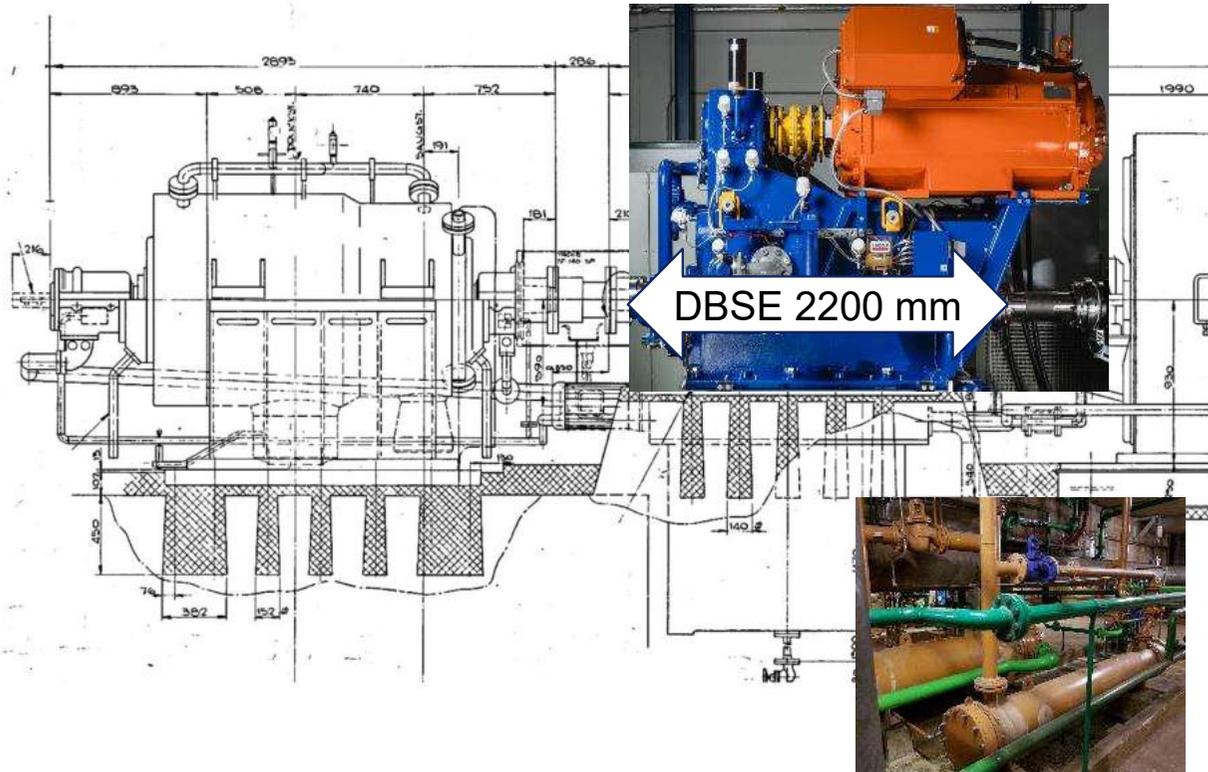
4.380 rpm

DBSE = 1890 mm

Boiler Feed
Pump

SETCON®

Motor



Customer's Preconditions:

- ✓ Takeover of anchor points
- ✓ Foundation & base frame unchanged
- ✓ Using existing cooling system
- ✓ Realization of the implementation during 21 days shut down of the power plant (regular revision)

Retrofit Project – Impressions

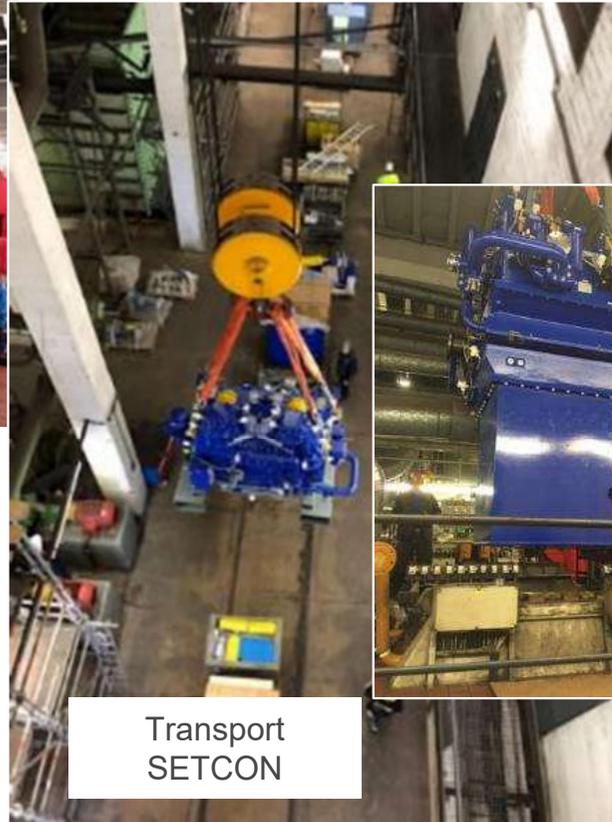
at swb Erzeugung AG - Bremen, Germany



Same Footprint as variable speed geared couplings!



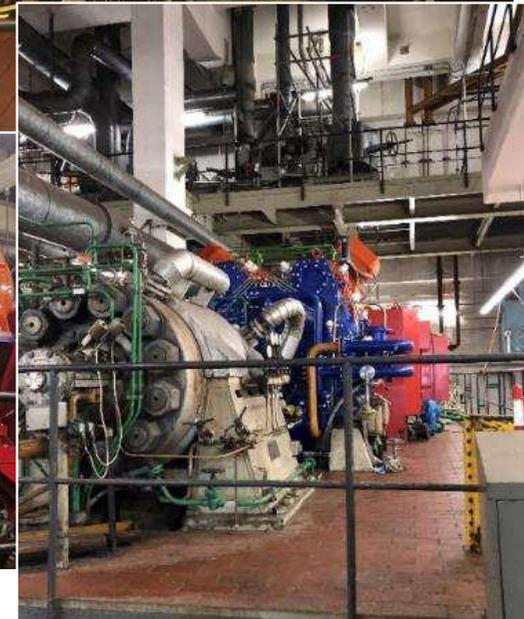
Removal of R18K600



Transport SETCON



Implementation SETCON



Retrofit Project – Economical Benefits

swb Erzeugung AG - Bremen, Germany



Boiler Feed Pump with **SETCON® SE6 / 600** – $P_{rated} = 6.070 \text{ kW}$

Criteria for Boiler Feed Pump	SETCON®	Geared Coupling
Efficiency	85% - 95%	30% - 85,5%
Increased Electricity Production (in continuous operation / estimation)	12 815 MWh / year	-
Earnings based on CoE of: 100 € / MWh (estimation)	1 281 500 € / year	-
Increase of Total Efficiency of power plant (estimation)	up to ~ 1%	-
Reduction of CO2 Emission (300 kg CO2/GJ - assumption)	~ 6 151 tCO2 / year [€ acc. CO2 price]	-
Installation time (net)	14-20 days	-

Retrofit Project – Partial Load Tests

SETCON Set-up at SET Test Bench in Austria



Boiler Feed Pump with **SETCON® SE6 / 600** – $P_{rated} = 6.070 \text{ kW}$

DCS at SET Test Bench



Servos A+B (LV- ASM)
710 kW, 50 Hz, 690 V

Gearbox SE6R

Integrated Lube Oil System
with integrated Oil Tank

Frequency Converter A + B

SSC: SETCON Control Cabinet (Interface to DCS)

Retrofit Project – Software Tests

Set-up at SET Software Test Bench in Austria



Boiler Feed Pump with **SETCON® SE6 / 600** – $P_{\text{rated}} = 6.070 \text{ kW}$



The SETCON “Miniature Model” enables software pre-testing by simulating DCS power plant operations to detect potential issues and to optimize control systems in advance. It minimizes risks, reduces commissioning time, and ensures reliable implementation.

- Customer PLC (Siemens S7) for testing on SW Test Bench
- SETCON “Miniature Model” (for SW-testing propose only)
- Simulated BFP
- Simulated Main Motor

Note: SETCON also can interpret existing scoop tube positions (%) and can calculate internally the corresponding output speed. This significantly reduces the effort required for DCS integration.

Replacement of Voith R17KGS (Germany) with SETCON SE6R

Retrofit Project – Overview

at RWE AG – Duisburg-Huckingen, Germany

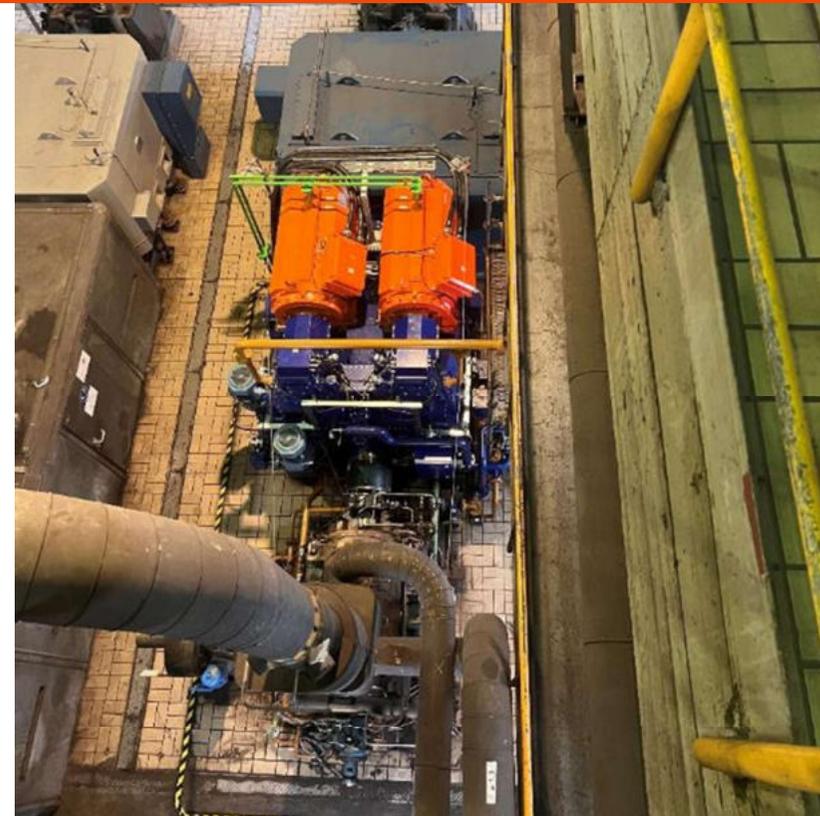


Installation Site:	HKM Power Plant, Duisburg-Huckingen, Germany
Configuration:	3x50%
Driven Equipment	Boiler Feed Pump
Max. Output Power	5.8 MW
Max. Output Speed	6.300 rpm
Speed Range	50% - 100%
Partial Load Operation	> 80% over the year

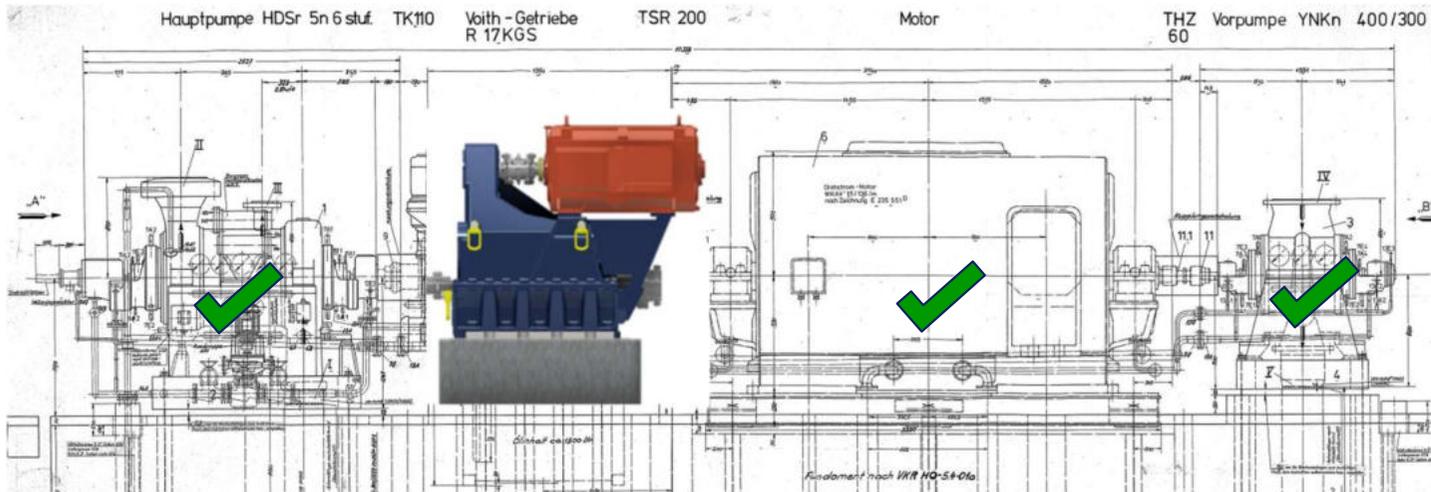
Project Goal:

Replacement of Voith R17KGS geared coupling to increase overall energy efficiency and reduce CO2 output of power plant.

STAHL.
DAS SIND WIR. HKM



Retrofit Project – Implementation at RWE AG – Duisburg-Huckingen, Germany



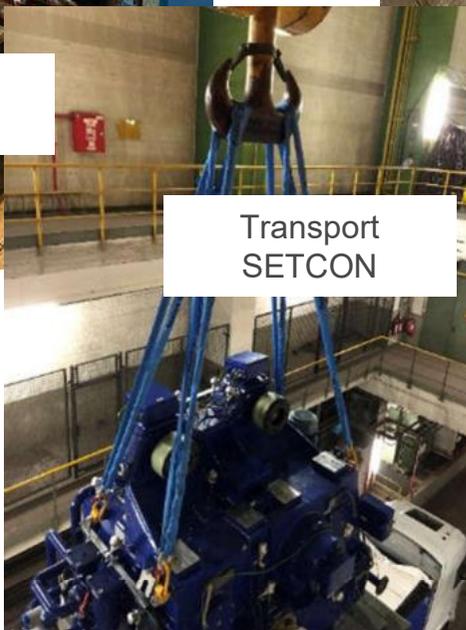
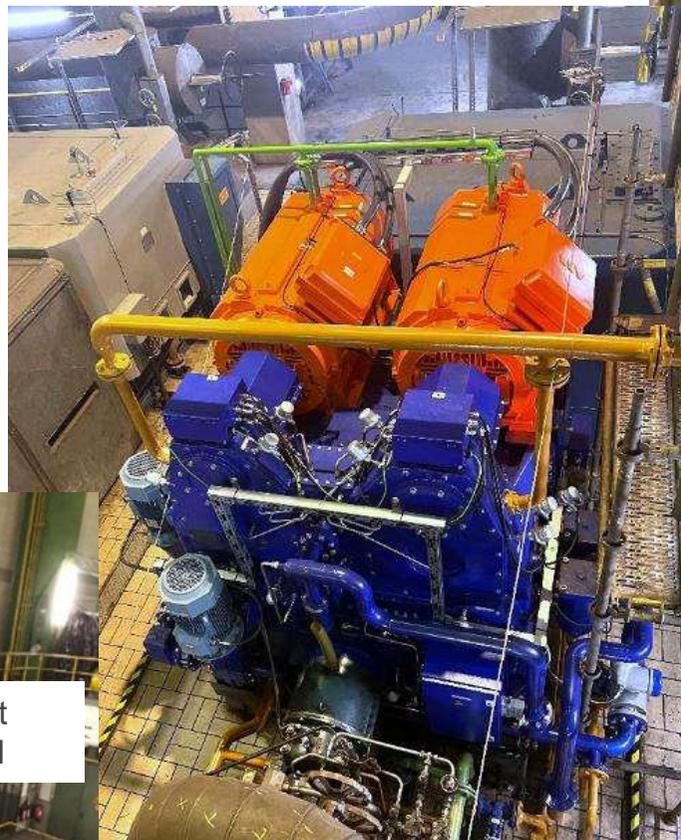
- Same Footprint as R17KGS
- No Modifications on Booster Pump required
- Same Main Motor (constant speed)
- No Foundation Work (same anchor points)
- **Installation Time ~ 15 days (net)**
- Planned follow-up Retrofits on-site: 1-5 units



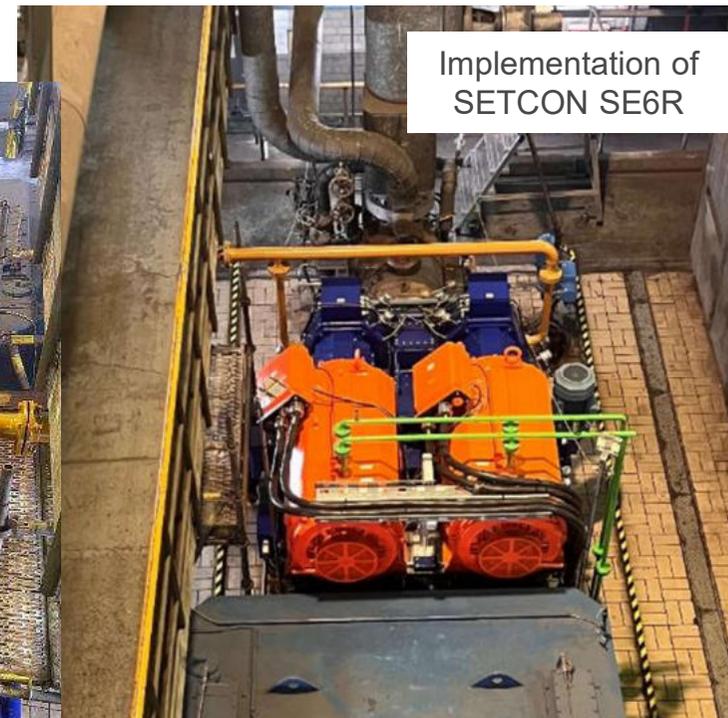
Retrofit Project – Impressions at RWE AG – Duisburg-Huckingen, Germany



Removal of R17KGS



Transport SETCON



Implementation of SETCON SE6R



Retrofit Project – Economical Benefits at RWE AG – Duisburg-Huckingen, Germany



Boiler Feed Pump with SETCON® SE6 – Prated = 5.800 kW

Criteria for Boiler Feed Pump	SETCON®	Geared Coupling
Efficiency	86% - 96%	50% - 90 %
Average Efficiency Increase (within Operating Speed Range)	1 333 kW	-
Increased Electricity Production (in operation for 4000 hours per year)	app 8 500 MWh / year	-
Earnings based on CoE of: 100 € / MWh (estimation)	850 000 € / year	-
Installation time (net)	14-20 days	-

Retrofit Project – Confirmation at RWE AG – Duisburg-Huckingen, Germany



RWE
SETCON®

SETCON SE6R – Bestätigung der Energieeinsparungen und des kontinuierlichen Betriebes bei RWE Generation SE

SETCON SE6R – Confirmation of energy savings and continuous operation at RWE Generation SE

Aufstellungsort: Kraftwerk Duisburg-Huckingen, Deutschland
 Location: power plant Duisburg-Huckingen, Germany

Projekt: Austausch einer Getrieberegelpkupplung (R17KGS) zur Energieeffizienzsteigerung
 Project: replacement of a geared variable-speed coupling (R17KGS) for increase of energy efficiency

Projekt Daten / project data	
Ende Inbetriebnahme vor Ort / end of commissioning on site	14.02.2025
Ende Probebetrieb / end of trial operation	19.02.2025

Technische Daten / technical data		
Baugröße / type	SETCON SE6R	
Seriennummer / serial number:	2020 220 01	
	Einheit / unit	Wert / value
Getriebe Ausgangswelle (zur Pumpe) / output shaft (to pump)		
Drehrichtung (in Leistungsfluss) / direction of rotation (in power flow)	---	CCW
Max. Leistung / max. power	kW	5 750
Max. Drehzahl / max. speed	U/min / rpm	6 282
Nennleistung / rated power	kW	4 305
Nenn Drehzahl / rated speed	U/min / rpm	5 830
Min. Drehzahl / min. speed	U/min / rpm	2 830
Übersetzung / ratio	---	Variabel / variable

RWE
SETCON®

a.) **Bestätigung der Einsparungen / confirmation of energy savings**

Untenstehende Tabelle zeigt die zuvor garantierten und im Anschluss (nach Probebetrieb) gemessenen Energieersparnisse. Für die Evaluierung der Daten wurde die Leistungsaufnahme der Getrieberegelpkupplung vor dem Ausbau in vier definierten Betriebspunkten gemessen. Nach dem Einbau des SETCON Systems wurde die Leistungsaufnahme erneut evaluiert und entsprechend verglichen.

The table below shows the previously guaranteed and subsequently (after the trial operation) measured energy savings.

For data evaluation, the power consumption of the geared variable-speed fluid coupling was measured at four defined operating points prior to its removal. After installation of the SETCON system, the power consumption was re-evaluated and compared accordingly.

Lastpunkte / operation points	1	2	3	4
Förderstrom / flow rate [t/h]	350	400	450	500
Drehzahl KSP / speed BFP [rpm]	3 911	4 124	4 367	4 580
Garantierte Energieeinsparung / guaranteed energy savings [kW]	1 049	1 044	1 025	1 040
Leistungsaufnahme KSP / power consumption BFP [kW]	2 859	3 251	3 689	4 054
Leistungsaufnahme SETCON / power consumption SETCON [kW]	1 702	1 920	2 225	2 676
Gemessene Energieeinsparung RWE / measured energy savings by RWE [kW]	1 157	1 331	1 464	1 378

b.) **Bestätigung des Betriebes / confirmation of operation**

Das SETCON SE6R System wurde am 14.02.2025 in Betrieb genommen, der Probebetrieb am 19.02.2025 erfolgreich abgeschlossen, und das SETCON SE6R System ist seitdem in Betrieb.

The SETCON SE6R system was put into operation on 14th of February 2025. Trial operation was successfully completed on 19th of February 2025, and the SETCON SE6R system has been in operation since then.

Duisburg, am / on the: 19.05.2025

Gencer, Irfan
(UI343726)

Iran Gencer / RWE Generation SE
(Projektleiter / project manager)

Klagenfurt, am / on the: 19.05.2025

Gerald Hebenberger / SET GmbH
(Geschäftsführung / CEO)

Confirmation of Energy Savings and Successful Operation by customer.

„Final Energy Savings have been +15% greater than expected / guaranteed“

Vendor Registered at (among others):



Vendor ID: 10112049 / Plant ID: 30014623
#9com: 600000722 variable speed gearbox

Vendor ID: 104158 / AVME 2.20 A

Aramco Overseas Company B.V.
Primus Beestdijkweg 25
2591 AD The Hague
The Netherlands
Tel: +31 (0) 88 262 2000
Fax: +31 (0) 88 262 2000
www.aramcooverseas.com

SET SUSTAINABLE ENERGIES
ATTN: QA/QC CONTACT-T. WOHLMUTHER
ERNST DIEZ STRASSE 6
9020 KLAGENFURT
AUSTRIA

The Hague, August 20, 2024
AOC Ref: AA/IL.107000272949

SUBJECT: PLANT EVALUATION

Vendor ID: 10112049 - Plant ID: 30014623 - Ariba Network ID: AN11194218657

Dear Mr. WOHLMUTHER,

In AOC letter from APRIL, 15th, 2024 we informed you that you plant SET SUSTAINABLE ENERGIES was "Approved with Corrective Actions".

We are pleased to inform you that following a further evaluation your company status has changed and is now Approved with limitations to supply the 9COM material(s) listed in the attachment.

This approval should not be regarded as a commitment from Aramco Overseas Company (AOC) to purchase from you. However, your company will have the opportunity along with other approved suppliers to respond to requests for quotation in accordance with AOC's established policies and procedures.

It is the responsibility of the manufacturer to notify AOC in a timely manner of any change of company name and/or address, change of manufacturing location (sub sourcing fabrication of major components) and/or discontinuance of production of approved material(s). The notification should be presented on your company letterhead paper, signed by Senior Management and addressed to the AOC Supervisor Sourcing & Supplier Relationship Management (SRM) Unit at SRM@aramcooverseas.com.

Please quote the above referenced Vendor ID and Plant ID in all future correspondence.

We would like to take this opportunity to thank you for your interest in doing business with AOC and SAO.

For any questions regarding this notification, please use the aforementioned email address.

Yours faithfully,

Seema Khan

Seema Khan (A)
Supervisor Sourcing & SRM
Supply Chain Management Dept.

شركة تنمية نفط عُمان
Petroleum Development Oman L.L.C.
CERTIFICATE OF REGISTRATION - PRODUCT VENDOR

CERTIFICATE NUMBER : **REG1001997-2021**
VENDOR CODE : **104158** DATE OF ISSUE : 31.05.2021

PETROLEUM DEVELOPMENT OMAN LLC
CERTIFIED THAT:

MANUFACTURER : SET GmbH
COUNTRY OF ORIGIN : Austria
LOCAL AGENT : GLOBAL PAVILION LLC
COMMERCIAL AGENCY NO.: 31358
POSTAL ADDRESS : 845 AL ATHEIBAH P.O. Box 845 AL ATHEIBAH

IS REGISTERED WITH THE COMPANY AS AN APPROVED PRODUCT VENDOR WITH EFFECT FROM THE DATE OF ISSUE OF THIS CERTIFICATE FOR THE FOLLOWING PRODUCT GROUP CATEGORIES :

MECHANICAL EQUIPMENT

AVME NO.	PRODUCT CATEGORY	PRODUCT SUB CATEGORY	APPROVED & QUOTA	REMARKS	Approved/Disapproved Status
AVME 2.20A	ELECTRO MECHANICAL EQUIPMENT	ELECTRO MECHANICAL VARIABLE SPEED TRANSMISSION SYSTEM			

Al Adab Al Kabeer 1995
Vendor Management & Procurement Support Lead

THIS CERTIFICATE IS VALID UNTIL: 24.06.2023 CERTIFICATE NUMBER: REG1001997-2021
PLEASE VISIT OUR WEBSITE FOR DETAILS Page 1 of 2



Smart technology
for our Environment and
your benefit

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