29th DCA Annual Congress 2025
9th October

STREICHER

Practical Experiences from 4 Years of Decarbonised HDD Job Sites

of Different Dimensions, Lengths, and Soil Classes

Boris Böhm | MAX STREICHER GmbH & Co. KG aA

STREICHER Group Overview

- Internationally operating construction, technology and technical services company
- Over 110 years of experience, a wide range of services and specialised equipment
- Integrated solutions for major national and international projects

Headquarters: Deggendorf

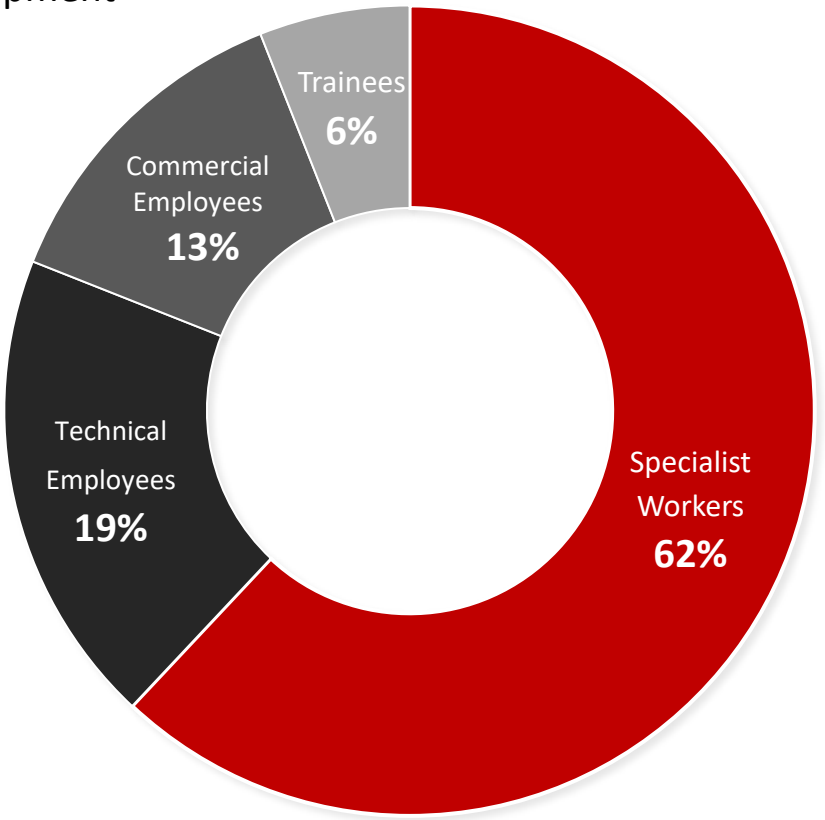
Locations: Over 30

Associated Companies: 22

Number of Employees: Over 4.500

Business Sectors:

- Pipelines and Plants
- Mechanical Engineering
- Electrical Engineering
- Civil and Structural Engineering
- Raw and Construction Material



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STREICHER Group HDD

Business Unit STREICHER HDD

Planning, preparation, and execution of horizontal directional drilling (HDD), pipe jacking and vertical directional drilling (VDD) projects.

HDD

- Focus on onshore projects and landfall operations
- Capable of:
  - Drilling diameters of up to 1,400 mm
  - lengths reaching 3,000 metres
- Equipment includes
  - High-performance drilling rigs with pulling forces of up to 350 t
  - Fully electric HDD systems under the *ecotec* label
    - current pulling forces of 20, 45, and 80 t

Pipe Jacking

- Controlled and uncontrolled drilling in confined spaces
- For diameters from DN 200 to DN 1400
- For trenchless crossings with distances under 15 m

VDD

- Drillings for geothermal energy and water supply
- Geotechnical investigations and installation of monitoring boreholes


Biogas Feed-In and Processing Plants
Plant Construction


Solar Parks
Electrical Engineering

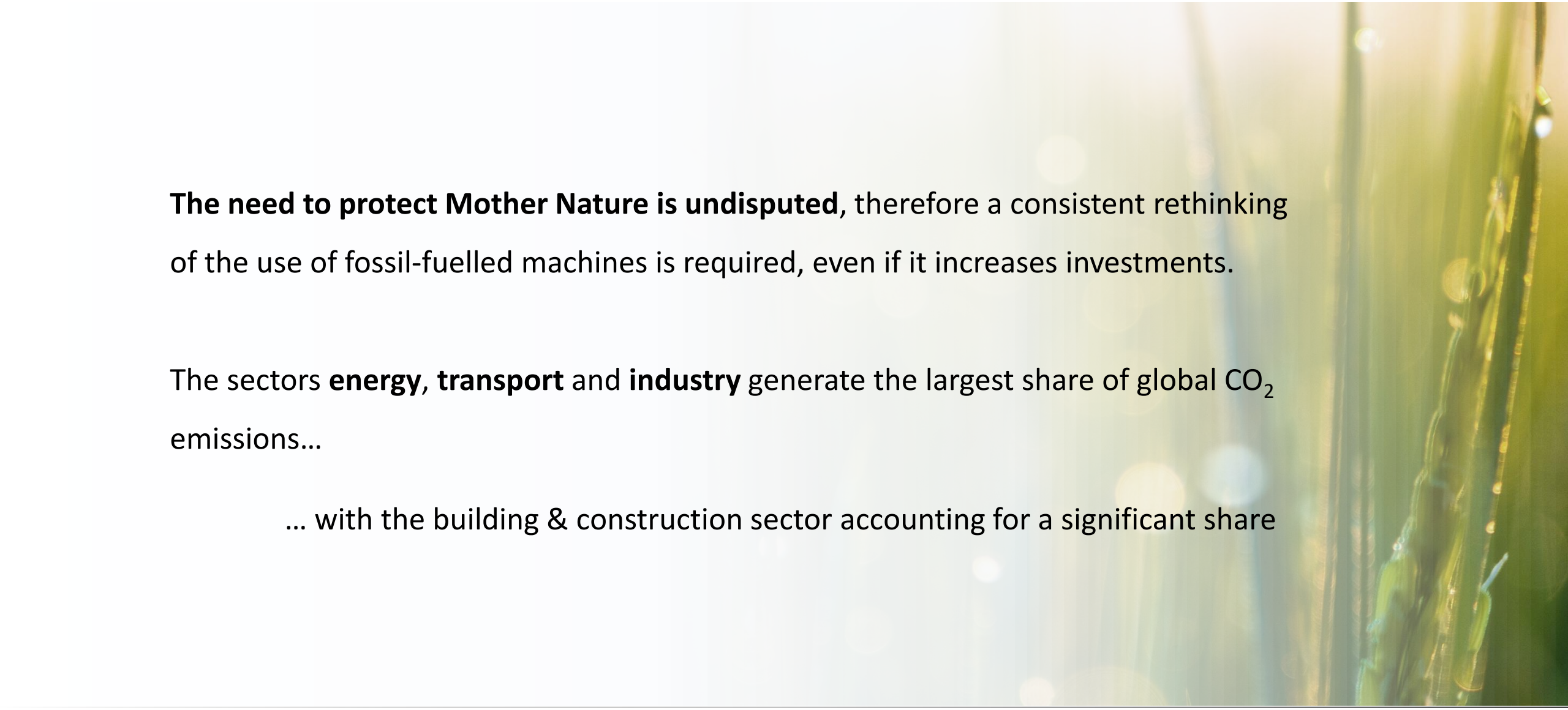

Wind Energy Expansion
Power Line Construction


Sustainable Construction
ecotec


Resource-Saving Installation Methods
Digital and Municipal Infrastructure


Hydrogen Transport Systems
Pipeline Construction

The Idea “Job Site Decarbonisation”



The need to protect Mother Nature is undisputed, therefore a consistent rethinking of the use of fossil-fuelled machines is required, even if it increases investments.

The sectors **energy**, **transport** and **industry** generate the largest share of global CO_2 emissions…

… with the building & construction sector accounting for a significant share

The Idea “Job Site Decarbonisation”

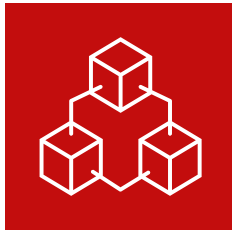
- The pipeline industry is crucial in the energy infrastructure and relevant for the energy-intensive industry
- Decarbonisation of the pipeline industry is mandatory, incl. the need to include a close look to your job sites

- Multiple influences contribute to the overall CO_2 output related job sites
- Work must be done properly, regardless of the eco-friendly solution applied
- Identifying drivers and causes for CO_2 emissions related to the job sites is the starting point

The Idea “Job Site Decarbonisation”

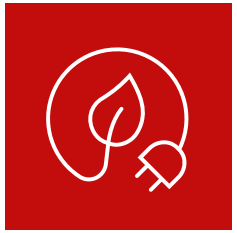
CO_2 Producer Groups

- Most CO_2 drivers and causes can be divided into the following three CO_2 producer groups:



Planning & Logistics

Technologies to be used



Equipment to be used

- CO_2 calculators are available for calculating the ecological footprint of individual private households
- No reliable CO_2 calculator covers all areas of typical complex pipeline job sites

The Idea “Job Site Decarbonisation”

CO_2 Producer Groups

- Even without a pipeline job site CO_2 calculator, typical emission drivers can be recognised

- In addition to the major emitters, especially small CO_2 sources are also worth noting, since…

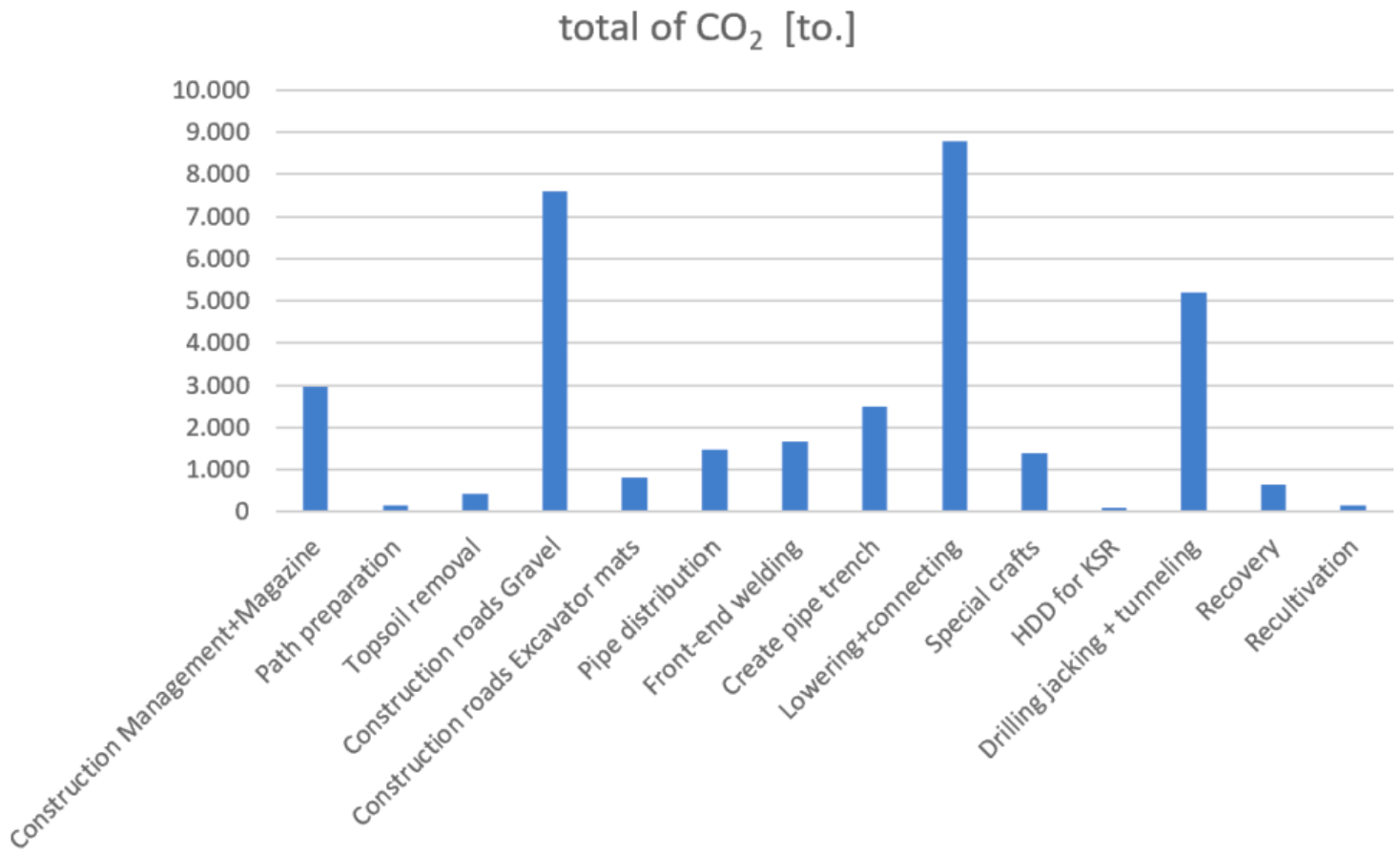
  … many pennies make a dollar

- Each reduction on many small areas adds up to a remarkable CO_2 saving in the end, and…

  … a penny saved is a penny earned

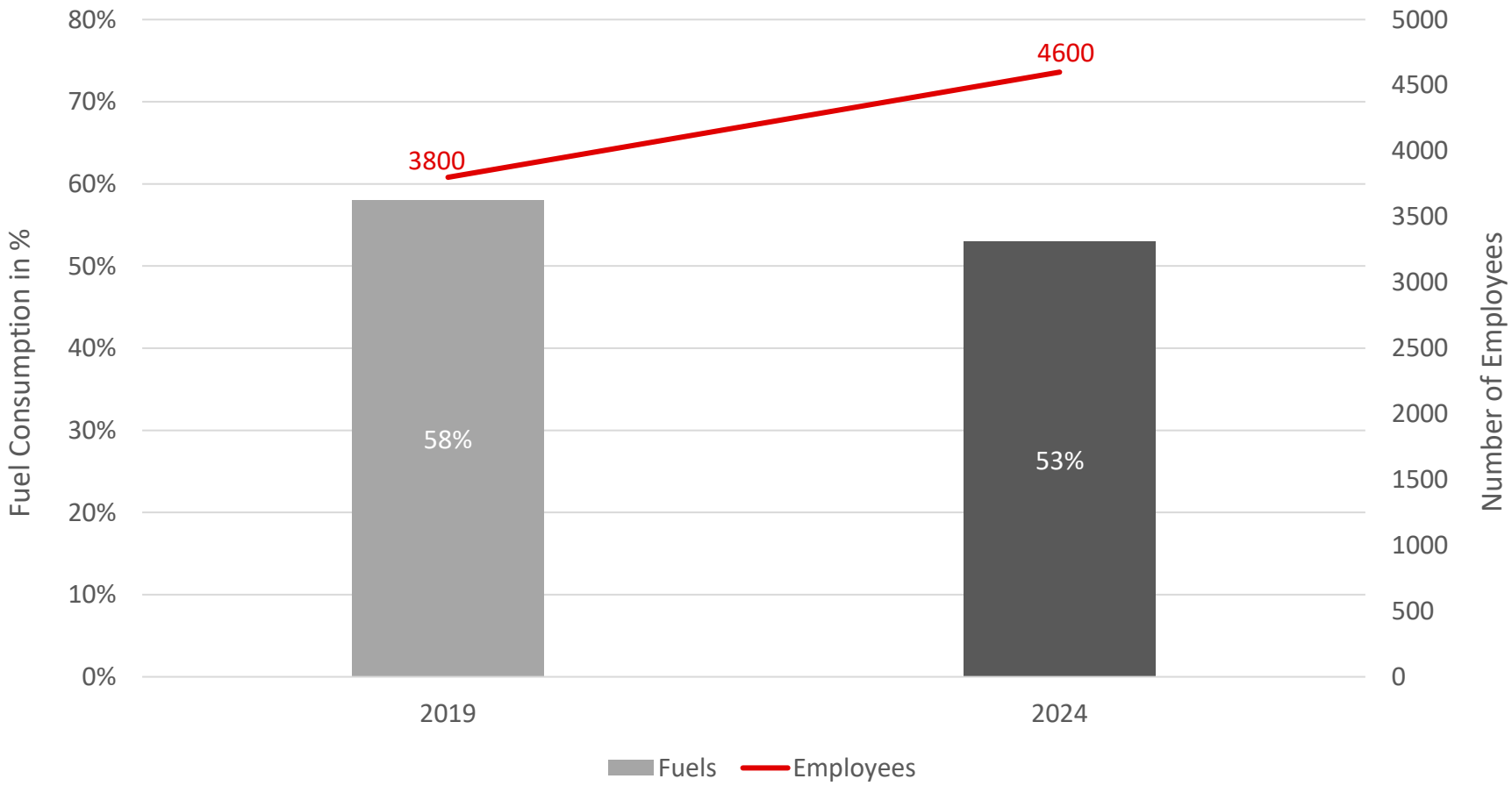
The Idea “Job Site Decarbonisation”

Analysis of a typical pipeline job site in Germany in terms of CO_2 emissions



The Idea “Job Site Decarbonisation”

Fuel Consumption of the STREICHER Group compared to Number of Employees



Selected HDD References With Fully Electric HDD Equipment

North Germany HVDC Project
- 12,000 m drillings (120 – 750 m each), 4 parallel drillings
- Sandy soil

Donauwörth Water Pipeline Project
- 603 m drilling, 510 mm steel pipe
- Clay, sandstone

Bogen Danube River Crossing
- 300 m drilling (with mud motor), 250 mm drinking water pipe
- Blue basalt

Plattling Isar River Crossing
- Duct installation under the river

South Germany HVDC Project
- 10,000 m drillings (230 – 400 m each)
- Clay, gravel, claystone, sandstone, loam

Selected HDD References With Fully Electric HDD Equipment


STREICHER HDD80-E

Netherlands

- 320 m drilling, 650 m reaming, 300 mm steel pipe, 90 mm protective conduit
- 1000 m drilling, 4 x 250 mm HDPE pipe

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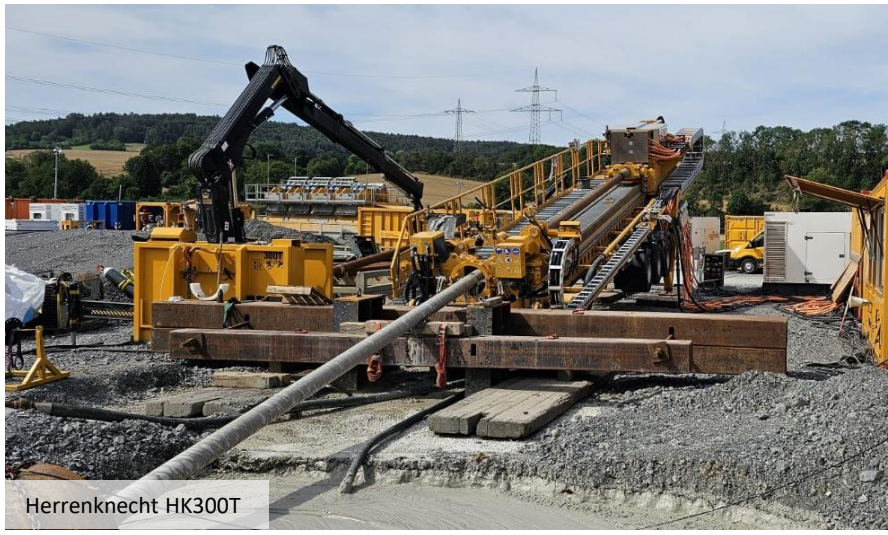
Terra DJ66e

Herrenknecht HK45


Herrenknecht HK300T

Selected HDD References With Fully Electric HDD Equipment

STREICHER HDD80-E

Netherlands

- 1063 m drilling, 315 mm pipe, 2x 200 PE
- 983 m drilling, 315 mm pipe, 2 x 200 PE
- Several drillings from 250 to 470 m, each 6 x 125 mm + 1 x 110 mm

Germany

- Several drillings from 280 to 370 m, each 3x 225 mm + 1 x 160 mm

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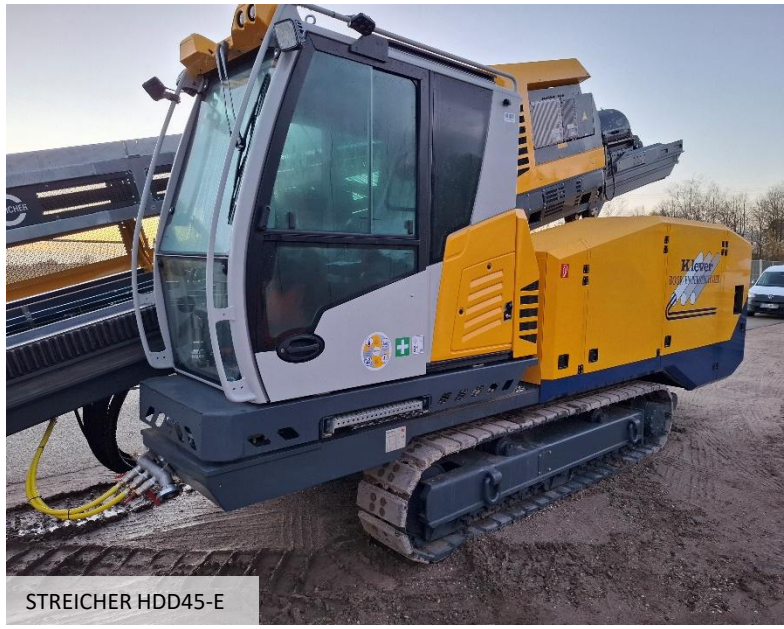
STREICHER HDD80-E


STREICHER HDD45-E

CO_2 Reduction Through Planning & Logistics

CO_2 Producer Group: Planning & Logistics

- Experience shows that up to a third of the project duration can be saved, which automatically means that CO_2 emissions can be significantly reduced simply by keeping the construction site infrastructure available for a shorter period…

- Catchy examples from this group are e.g. the choice of how to transport needed construction machinery, the creation of a perfected overall infrastructure and a stockpile of critical parts, tools and emergency response teams

CO_2 Reduction Through Choice of Technology

CO_2 Producer Group: Choice of Technology

Different technical approaches can be chosen to do the same job…

- E.g. you could dig a pipe trench with shovels, or you could use excavators or maybe trenchers

- Another example can be the decision whether to lay a section of a pipeline using the open trench method or by using trenchless technologies….

CO_2 Reduction Through Choice of Technology

Trenchless Technologies compared to Open-Cut Trenching

With an open trench, many necessary work steps contribute to the overall carbon footprint of the job site. These are e.g.:

- amount of material to be removed
- fuel consumption of construction equipment
- location of the construction site in combination with the required transport routes
- number of necessary truck loads

CO_2 Reduction Through Choice of Technology

Trenchless Technologies compared to Open-Cut Trenching

- Minimal surface disruption
- No or minimal surface restoration needed
- Fewer transport movements
- Shorter construction duration for same route
- Higher drilling energy consumption, but offset by reduced earthworks

Significant exemplary savings include up to*:

- ¾ less in CO_2 emission
- an overall 70+% saving in diesel consumption

*with the use of conventionally driven equipment

CO_2 Reduction Through Choice of Technology

Construction Roads: Gravel Roads, Wooden Plank Roads, Steel Plates

Choice of low emission construction road types are a key lever for a sustainable job site

- Lower fuel usage
- Reduced material consumption
- Compliance with environmental standards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CO_2 Reduction Through Choice of Technology

Construction Roads: Gravel Roads, Wooden Plank Roads, Steel Plates

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CO_2 Reduction Through Choice of Technology

Solar Container

- Reliable energy supply
- Sustainable alternative for diesel generators
- Easily transportable and deployable on different sites
- Operates silently
- Minimises soil and air pollution

CO_2 Reduction Through Choice of Technology

Saving Potential of the Dual Rod System

DUAL ROD SYSTEM		MUD MOTOR
Dual-rod assembly	**Driveline**	Drill head powered by drilling fluid
Mechanical drive – better overall efficiency	**Efficiency**	High hydraulic losses reduce efficiency
Lower consumption – Lower blowout risk due to reduced annular pressure	**Drilling Fluid**	Higher consumption – Higher blowout risk – requires additional effort to manage and mitigate blowouts
Less equipment necessary	**System Requirements**	More equipment necessary

CO_2 Reduction Through Eco-Friendly Equipment

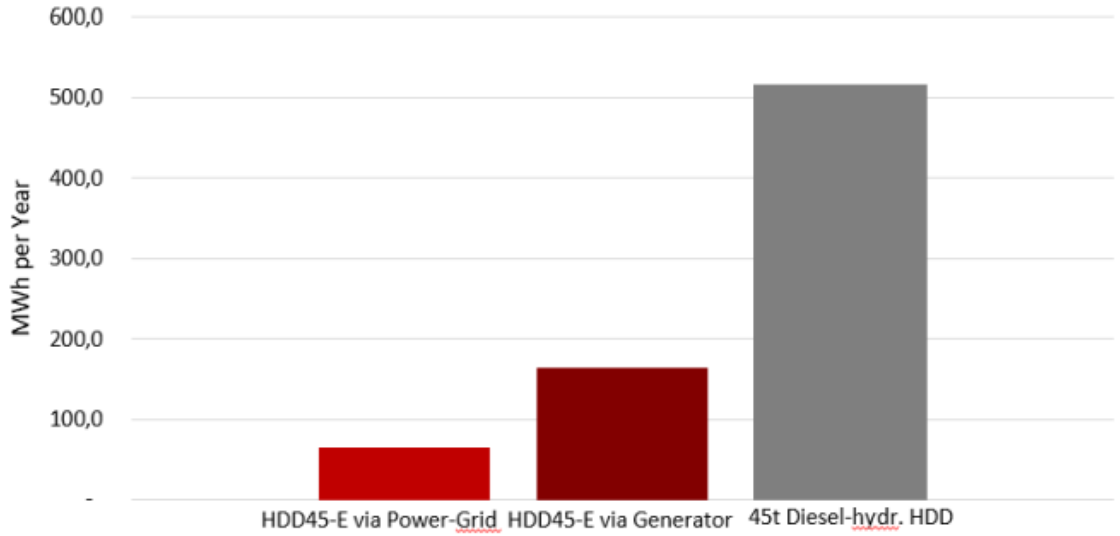
Fully Electric HDD Rigs

Advantages	Challenges
▪ Environmentally friendly	▪ Limited power supply on remote sites
▪ Low noise emission – ideal for residential/ nature zones	▪ Limited power supply compared to diesel rigs
▪ High efficiency – no hydraulic losses	▪ Technology still in development
▪ Energy recovery and storage possible	▪ Training for operators required
▪ Low maintenance – fewer moving parts	▪ Complex electronics
▪ Precise control – precise torque/ speed	
▪ Flexible energy sources: grid, generator or hydrogen	

CO_2 Reduction Through Eco-Friendly Equipment

HDD45-E via Power-Grid	HDD45-E via Generator	45t Diesel-hydraulic HDD system
Electricity	Heating oil	Diesel
65,3 Megawatt hours	16.240 Liter	52.800 Liter
65,3 Megawatt hours	**163,2** Megawatt hours	**517,4** Megawatt hours

Annual energy consumption in comparison



Working days per year	165
Working hours per day	8
Energy content heating oil kWh/liter	10,1
Energy content diesel kWh/liter	9,8

CO_2 Reduction Through Eco-Friendly Equipment

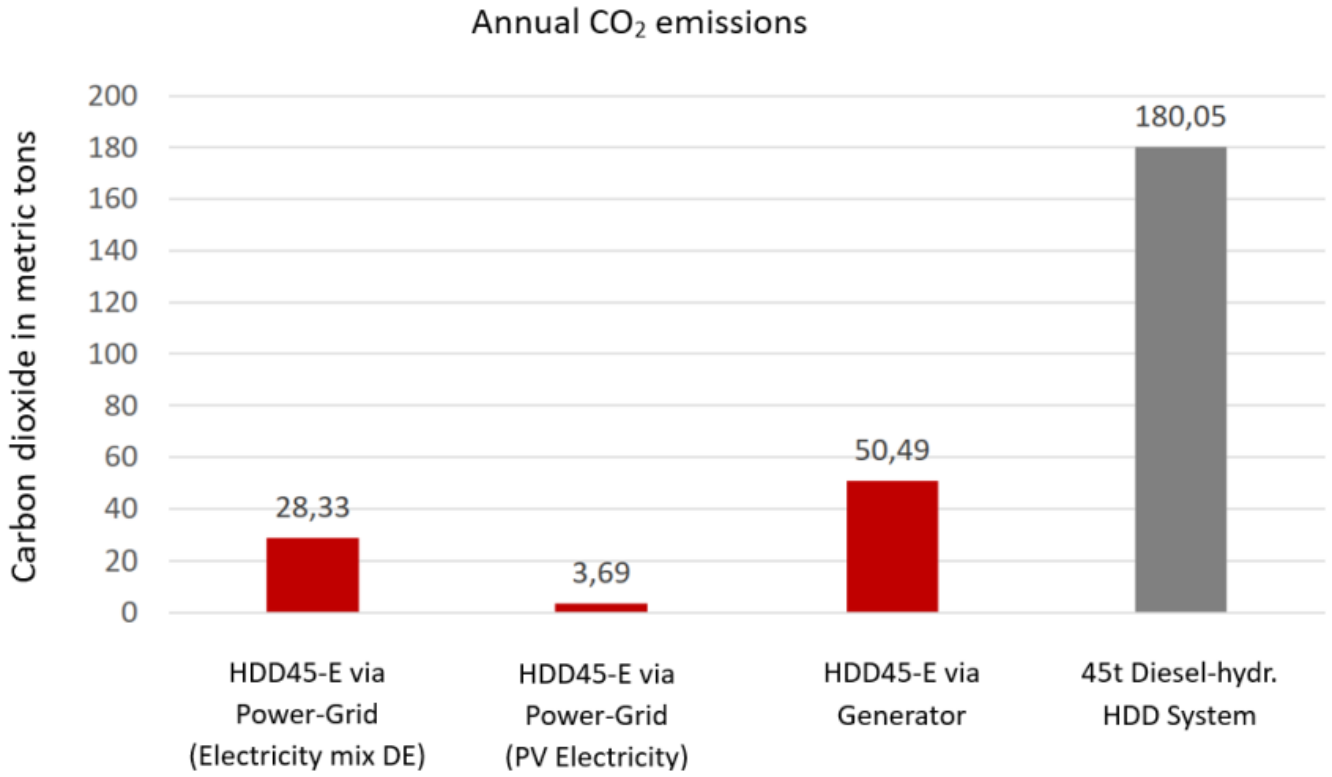
Energy Sources for Electric Machinery and Appliances

Energy Source	Advantages	Challenges
Green Electricity (grid)	Very low emissions, stable, cost-effective	Sufficient grid connection required
Mobile Battery Storage	Emission-free, low noise, mobile	Limited capacity, charging infrastructure required
Photovoltaics + Battery	Self-sufficient, sustainable, ideal for long-term construction sites	Weather-dependent, space requirements, investment costs
Green Hydrogen	Emission-free, high energy density	Expensive, infrastructure still in development
Hybrid Generators (Diesel + Battery)	Flexible, reduces emissions and fuel consumption	Not completely emission-free, maintenance required

Recommendations:

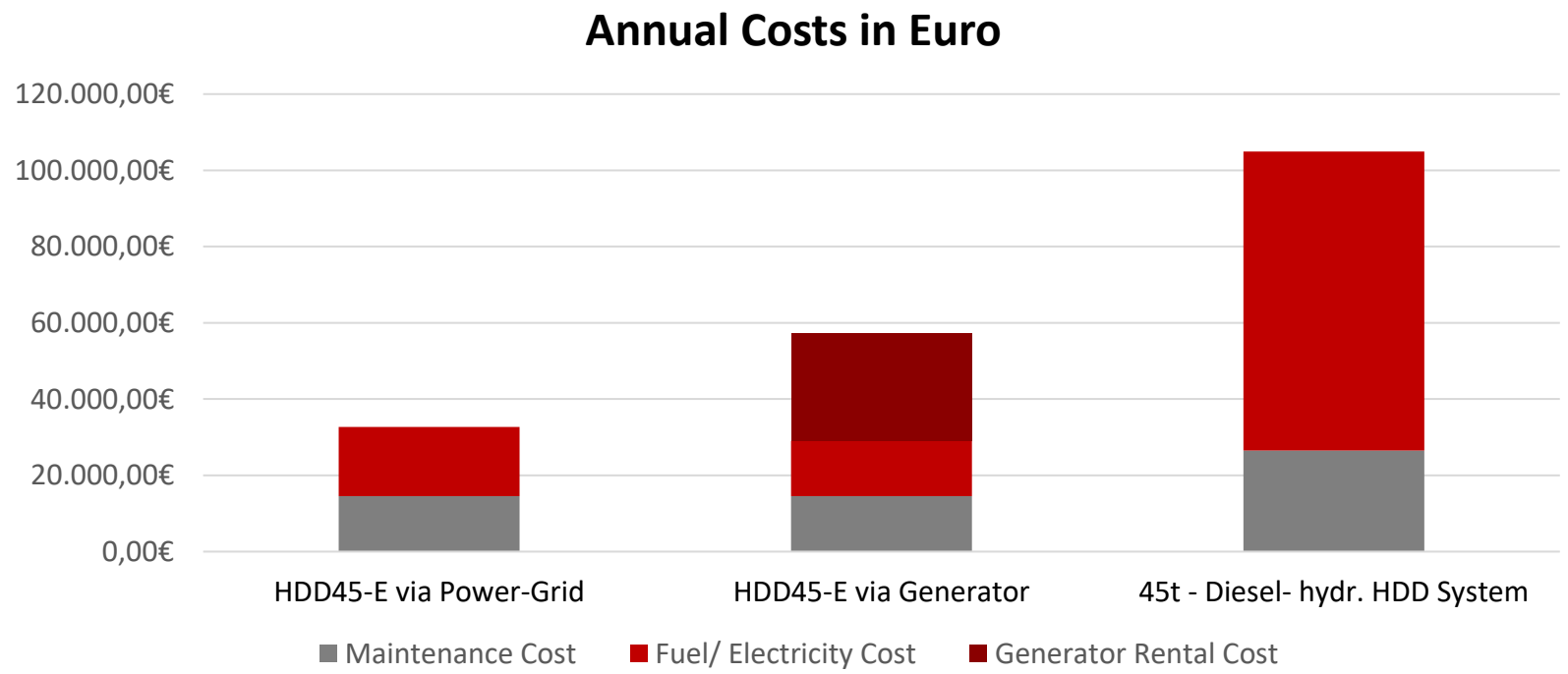
- **Sites with grid connections:** green electricity
- **Sites without grid connections:** mobile battery + PV modules
- **Emission-sensitive zones:** fully electric rigs + battery storage/ green electricity
- **Large-scale projects:** modular energy containers + PV, battery + generator

CO_2 Reduction Through Eco-Friendly Equipment



Rig	Energy source	Quantity	Unit	Factor	CO_2 emissions/year [t]
HDD45-E via Power-Grid (Electricity mix)	Electricity	**65.285,00**	kWh	0,0004340	**28,33**
HDD45-E via Power-Grid (PV Electricity)	Electricity	**65.285,00**	kWh	0,0000566	**3,69**
HDD45-E via Generator	Heating Oil	**16.240,05**	kWh	0,0031087	**50,49**
45t Diesel-hydraulic HDD System	Diesel	**52.800,00**	kWh	0,0034100	**180,05**

CO_2 Reduction Through Eco-Friendly Equipment



	HDD45-E via Power Grid	HDD45-E via Generator	45t – Diesel-hydr. HDD System
Maintenance	14.541,66 €	14.541,66 €	26.544,43 €
Fuel/ Electricity Cost	18.149,23 €	14.566,29 €	78.421,82 €
Generator Rental Cost	- €	28.264,50 €	- €
Total	**32.690,89 €**	**57.372,45 €**	**104.966,25 €**

CO_2 Reduction Through Eco-Friendly Equipment

Maintenance Costs: Fully Electric vs. Conventional HDD Rigs

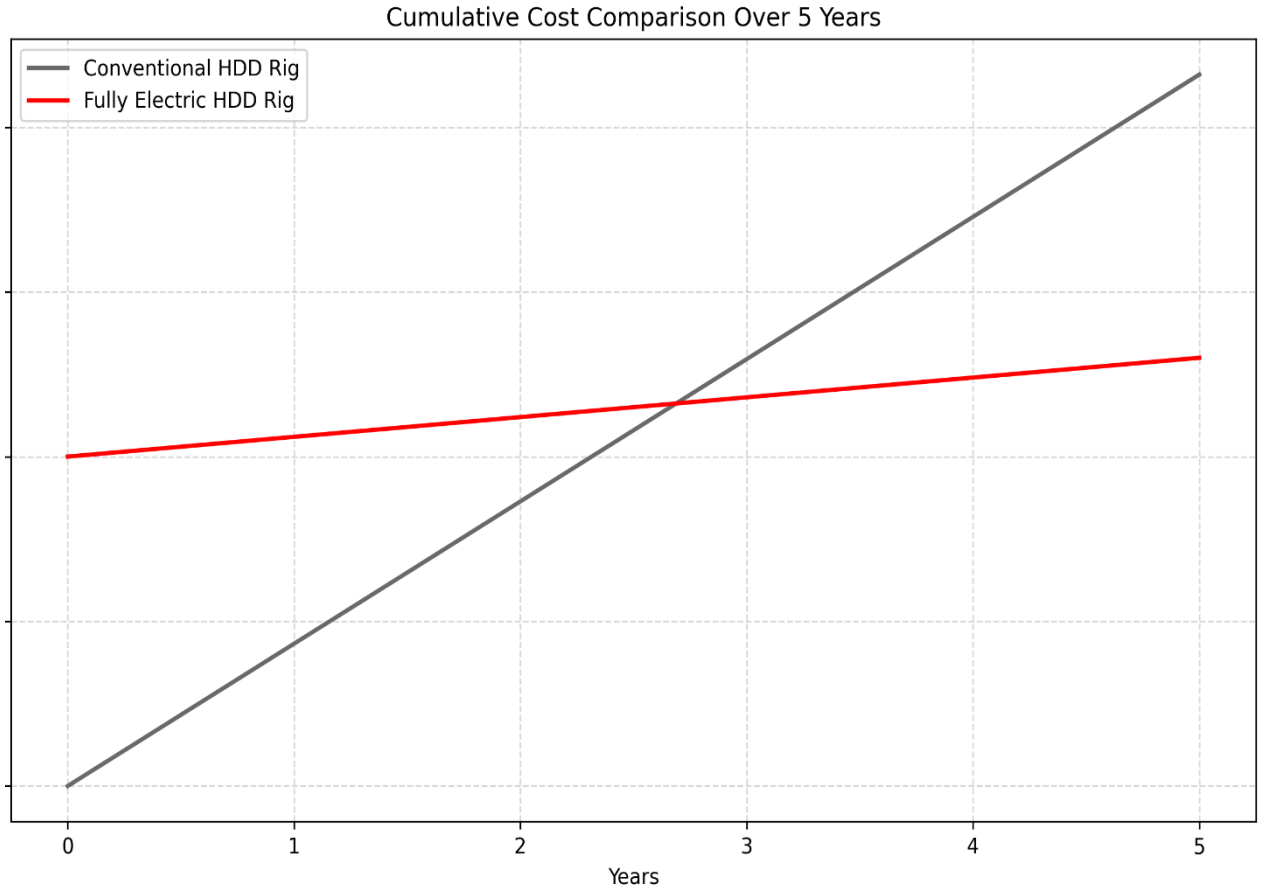
Aspect	Fully Electric HDD Rig	Hydraulic HDD Rig
Hydraulic Maintenance	Minimal	High
Motor Maintenance	Low (electric)	High (diesel)
Spare Parts Demand	Low	High
Diagnostics & Control	Digital, automated	Manual, partly analogue
Total Maintenance Cost	30-50% lower	≈70% higher

Maintenance Cost Drivers

- Hydraulic oil changes
- Hydraulic filter replacements
- Diesel engine maintenance
- Electric motor inspection
- Software diagnostics and updates
- General inspection
- Hydraulic leak detection and repair

CO_2 Reduction Through Eco-Friendly Equipment

Amortisation: Fully Electric HDD Rigs (example)



Key Takeaways

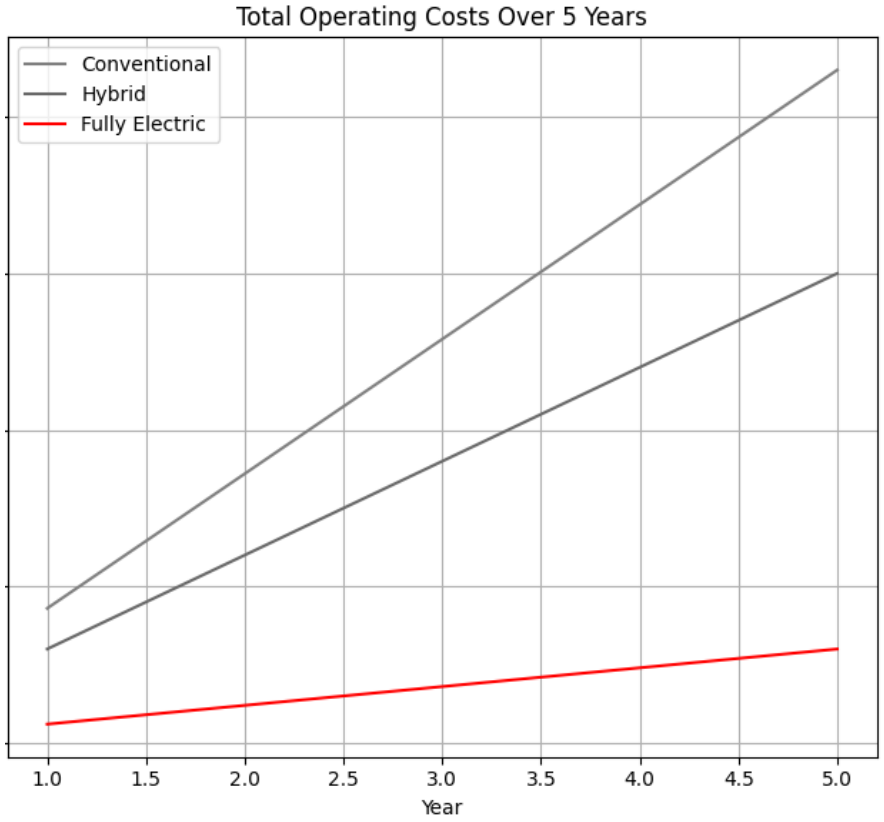
- Higher initial investment compared to conventional rigs
- Significantly lower operational costs
- Pays off within ≈ 5 years
- Longer usage = greater savings
- Rising diesel prices accelerate payback

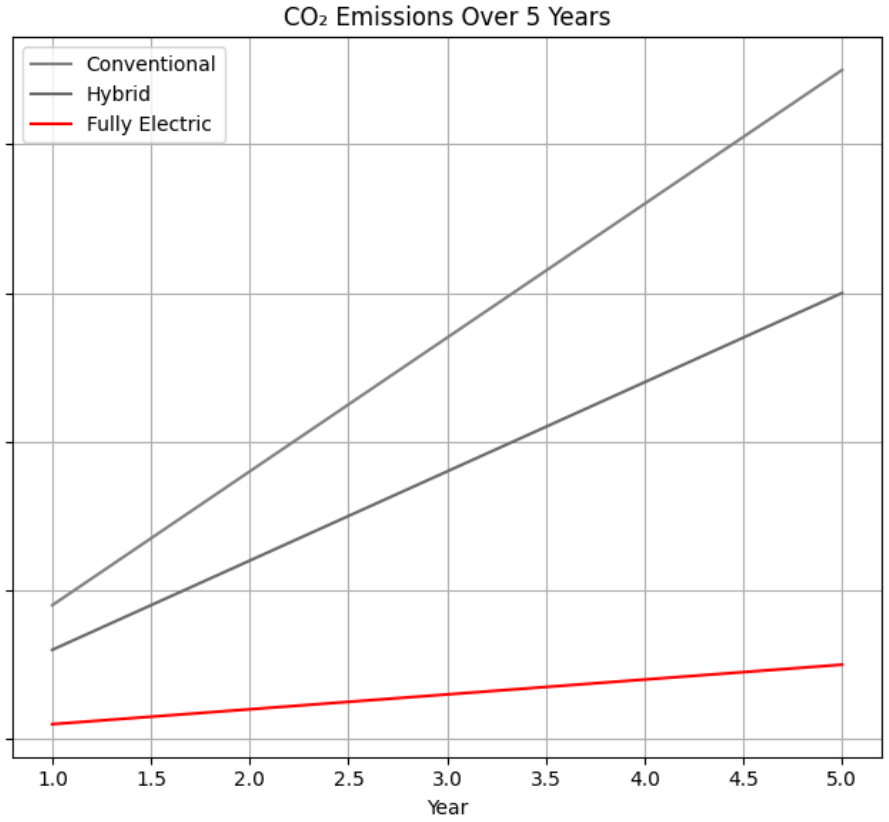
→ Remain cost-effective even with rising electricity prices

→ Outperform conventional rigs over 5 years in several scenarios

CO_2 Reduction Through Eco-Friendly Equipment

Simulation of Conventional, Fully Electric and Hybrid HDD Rigs Over 5 Years





→ Fully electric rigs are the most cost-effective and sustainable option

→ Hybrid rigs offer a strong middle ground

CO_2 Reduction Through Eco-Friendly Equipment

Tender Advantages with Fully Electric HDD Rigs

Germany
- Sustainability criteria are considered more frequently
- Low-emission rigs meet legal and pilot project requirements

Netherlands
- Emission-free equipment already required in 10% of tenders
- Strategic fit with national circular economy goals

Other EU Countries
- EU law allows environmental criteria in tenders
- Countries like DK, NO, NL apply CO_2 limits or penalties

CO_2 Reduction Through Eco-Friendly Equipment

Training Operators of Fully Electric HDD Rigs

Basic and Specialist Courses

- DVGW certified HDD training
- e.g. BAU-ABC Rostrup, Bohrmeisterschule Celle
- DCA seminars (geology, drilling fluids, equipment)

Practical Training

- VR simulators
- On-site hands-on sessions

Technical Qualifications

- Electrical safety certification (DGUV/ DIN VDE)
- Drilling fluid handling courses

Best Practices

- Combine theory, practice and simulation
- Use certified programmes
- Interdisciplinary teams
- Regular refreshers on technology, standards and safety

Excursus – Noise Emissions and Sound Pressure Level

60 dB(A)

Normal conversation

68 dB(A)

HDD45-E

70 dB(A)

PASSENGER CAR
(60 km/h)

90 dB(A)

Freight train
(100 km/h)

91 dB(A)

Diesel-hydraulic HDD-Rig

100 dB(A)

Jackhammer

Critical value: Daily noise exposure level **> 80 dB(A)**
Long-term exposure has negative effects on physical and mental health

CO_2 Reduction Through Holistic Concepts

Decarbonised HDD Job Site concept

Power-Grid-Setup

CO_2 Reduction Through Eco-Friendly Equipment

Decarbonised HDD Job Site concept

Hydrogen-SetUp

Further Development of Eco-Friendly Solutions

Decarbonised HDD Job Site concept

Rechargeable Batterie-SetUp

CO_2 Reduction Through Holistic Concepts: Equipment

Rigs from the ecotec HDD-E series

- All-electric drilling rigs
- Battery buffer
- Very low noise emissions
- Reduced CO_2 emissions
- Flexible feed-in
- Very suitable for nature conservation zones
- Anti-collision systems
- Double rod system (in development)

CO_2 Reduction Through Holistic Concepts: Equipment

HDD mobile Mixing Systems
for Power-Grid / Generator

HDD mobile Recycling Systems
for Power-Grid / Generator

CO_2 Reduction Through Holistic Concepts: Equipment

HDD Mobile Electric Mudpumps for Power-Grid / Generator

CO_2 Reduction Through Holistic Concepts: Equipment

Centrifuge

System Control

Flocculant Station

Electrics

Centrate Water

Mobile Processing Systems for Drilling Fluid for Sewage Treatment Plant Discharge / Centrate Water Reuse

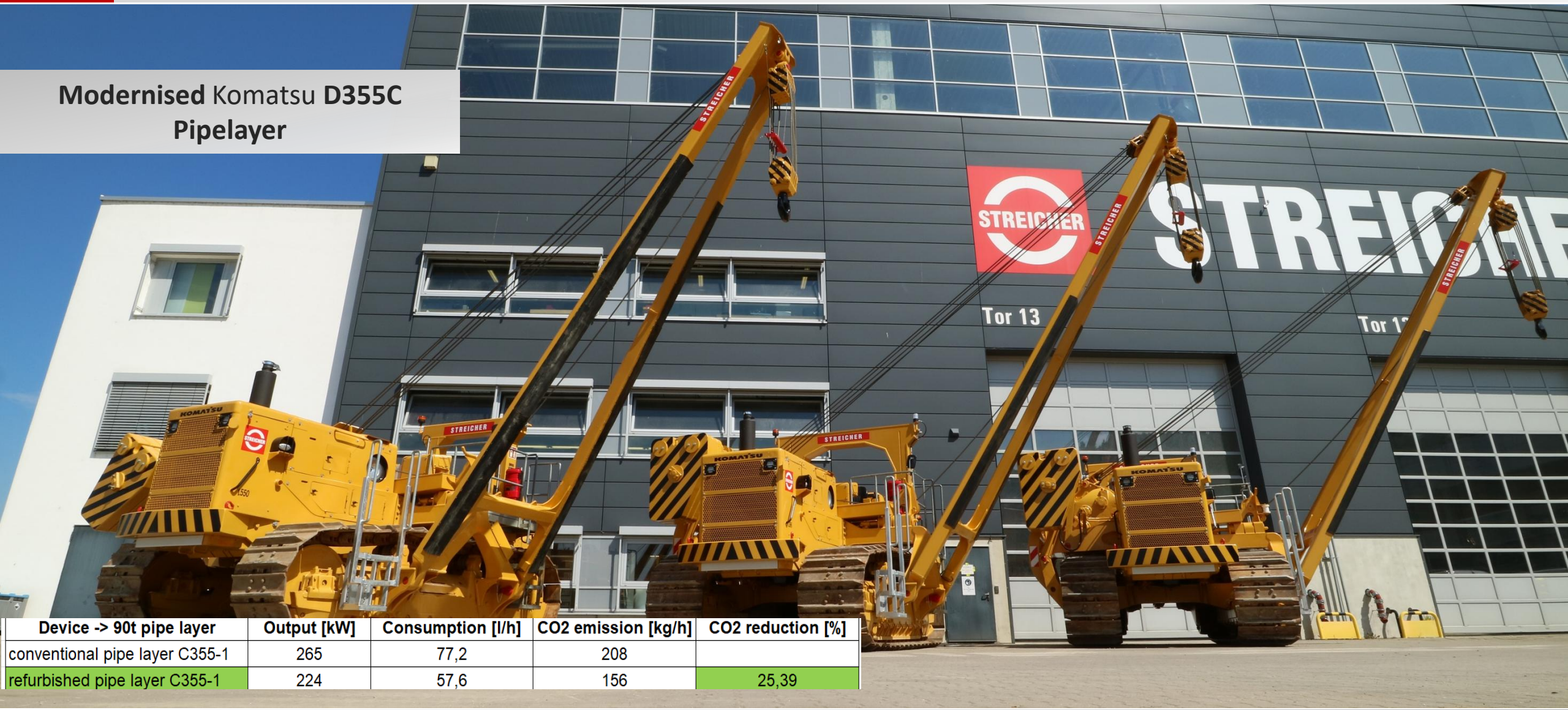
CO_2 Reduction Through Eco-Friendly Equipment

PW150-E Pay Welder

Device -> 4Pos. pay welder	Output [kW]	Consumption [l/h]	CO2 emission [kg/h]	CO2 reduction [%]
conventional pay welder	245	42,1	114	
ecotec pay welder PW150-E	148	19,4	52	53,92

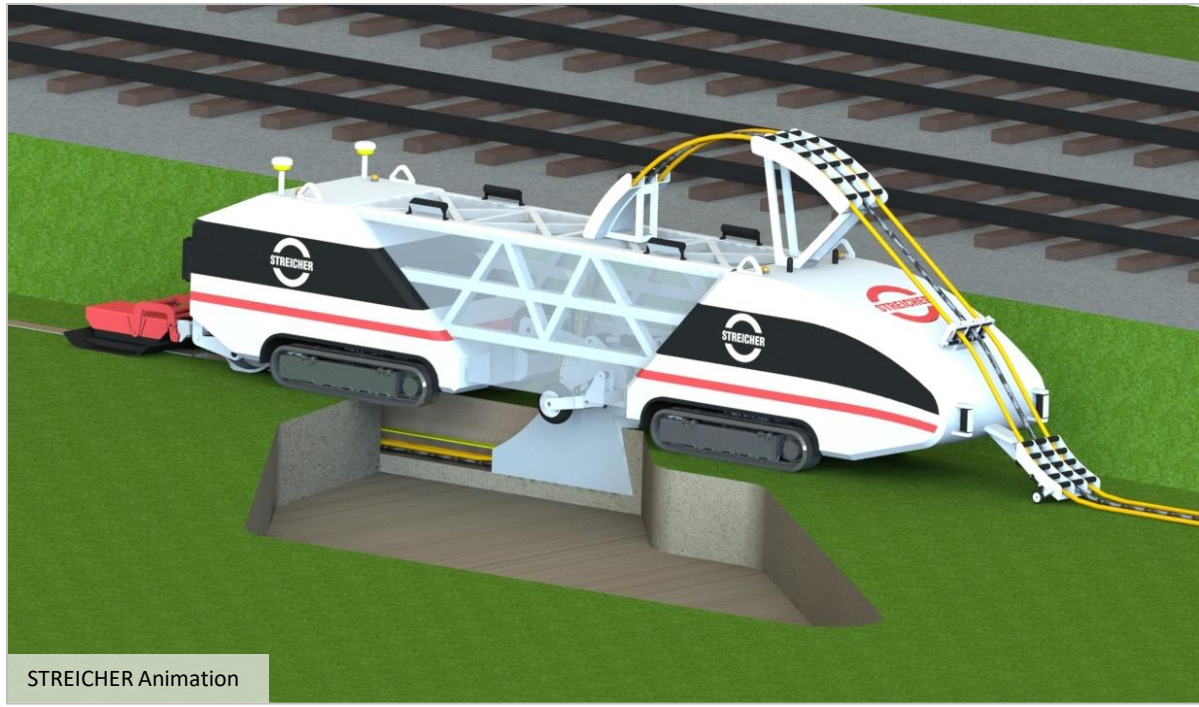
CO_2 Reduction Through Eco-Friendly Equipment

Modernised Komatsu **D355C Pipelayer**

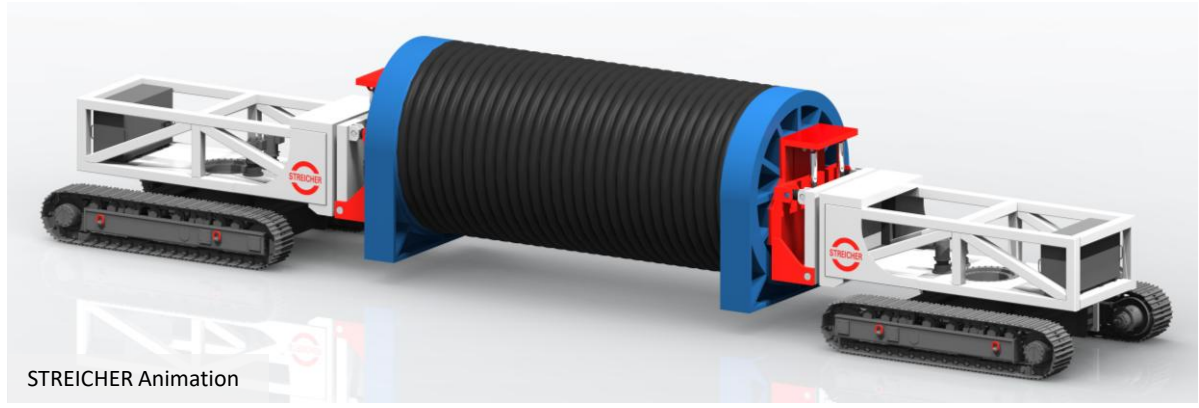


Device -> 90t pipe layer	Output [kW]	Consumption [l/h]	CO2 emission [kg/h]	CO2 reduction [%]
conventional pipe layer C355-1	265	77,2	208	
refurbished pipe layer C355-1	224	57,6	156	25,39

Further Development of Eco-Friendly Equipment



STREICHER Animation



STREICHER Animation

CO_2 Reduction on Construction Sites

Top Measures

Alternative Construction Materials	< 70%	Optimised Logistics and Means of Transport	10 – 15%
Material Recycling	< 60%	Digital Planning and Process Optimisation	5 – 10%
Electrified Machinery	30 – 50%	Carbon Capture and Storage (CCS) at Cement Factories	< 90%
Use of Renewable Energy	10 – 20%	Use of Low-Carbon Cement and Concrete	20 – 40%

Project Examples

- Sea Lock Ijmuiden (Netherlands): Efficient pumps, optimised constr. processes, sustainable material choices
- Strategy Roadmap *Baustelle 2045* (Germany): Electrified machinery, digital planning, circular economy approaches
- Circular Economy Projects (McKinsey/ WEF): Reuse of concrete and steel, CO_2 storage in cement production

CO_2 Reduction on HDD Job Sites

Top Measures

Choice of HDD Method Instead of Open-Cut	**30 – 50%**	Optimisation of the Drilling Fluid (Recycling & Additives)	**10 – 15%**
Electrification of HDD Rigs	**20 – 40%**	Digital Planning and Control	**5 – 10%**
Reduction of Transport Emissions	**10 – 15%**	Energy-Independent Site Setup	**5 – 10%**

HDD Project Examples

- Baltic Pipe Project (Denmark/ Poland): Use of HDD instead of open-cut, fluid recycling, optimised logistics
- Trans Atlantic Pipeline (Greece/ Albania): Local materials, efficient drilling rigs, digital planning
- HDD project for Gasunie (Netherlands): Electric pumps, drilling fluid recycling, use of HVO100
- Fibre-Optic Installation via HDD (Scandinavia): Small electric HDD rigs, mobile PV systems

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