

WACKER

CREATING TOMORROW'S SOLUTIONS

HELISOL®

RENEWABLE ENERGY | SOLAR

HELISOL® 5A –
A NOVEL SILICONE-BASED
HEAT-TRANSFER FLUID

A NEW LEVEL OF EFFICIENCY FOR PARABOLIC TROUGH CSP

Sunlight is key to sustainable energy production. New HELISOL® 5A from WACKER is key to high-efficiency, concentrated solar-power (CSP) systems. HELISOL® 5A is a silicone-based heat-transfer fluid intended especially for parabolic trough CSP plants. HELISOL® 5A can withstand temperatures up to 425 °C for long periods, and retains its low viscosity even at -40 °C.

When used in combination with parabolic trough collectors, the fluid delivers efficiencies and operational advantages unrivaled by conventional heat-transfer fluids.

Maximum Efficiency, Reliability and Economics

HELISOL® 5A heat-transfer fluid delivers maximum efficiency, reliability and economics as it powers its way through the 400 °C barrier:

- High thermal stability
- Good heat transfer
- Low pour point
- No critical degradation products
- Higher power-block efficiency
- Fewer environmental and health risks

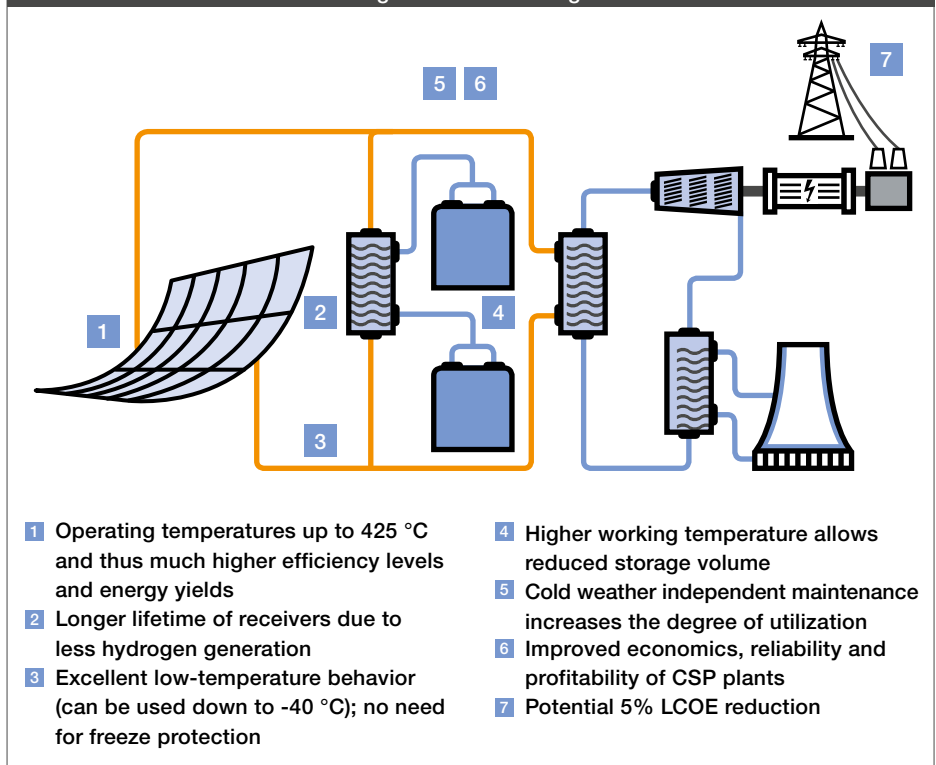
Conclusion

HELISOL® 5A offers many advantages, withstanding temperatures of up to 425 °C for long periods and retaining its low viscosity even at -40 °C.

Huge Savings Potential

HELISOL® 5A delivers not only higher efficiency levels, but also greater cost effectiveness, while offering superior business benefits in terms of capital (CAPEX) and operating expenses (OPEX) compared to organic BP/DPO (biphenyl/diphenyl oxide):

Schematic Draw of a Parabolic Trough Plant – Advantages of HELISOL® 5A



- 1 Operating temperatures up to 425 °C and thus much higher efficiency levels and energy yields
- 2 Longer lifetime of receivers due to less hydrogen generation
- 3 Excellent low-temperature behavior (can be used down to -40 °C); no need for freeze protection
- 4 Higher working temperature allows reduced storage volume
- 5 Cold weather independent maintenance increases the degree of utilization
- 6 Improved economics, reliability and profitability of CSP plants
- 7 Potential 5% LCOE reduction

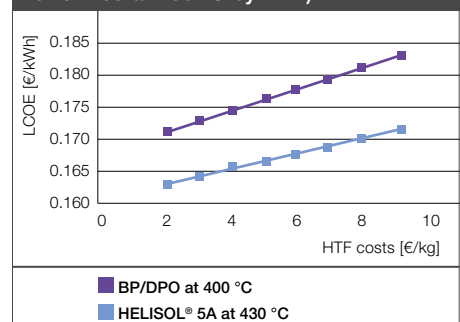
CAPEX

- Lower energy-storage costs
- No freeze protection needed
- Can be filled at any time (irrespective of temperature)
- No ullage needed for viscosity control
- Higher vapor pressure needs to be taken into consideration

OPEX

- No circulation needed to provide freeze protection
- Maintenance at any time
- Less pumping energy (low viscosity)
- Shorter startup period
- Lower degradation/exchange rate at same temperature
- Less H₂ formation
- No fouling

Lower LCOE with HELISOL® 5A (Simulation Performed at 430 °C by DLR)

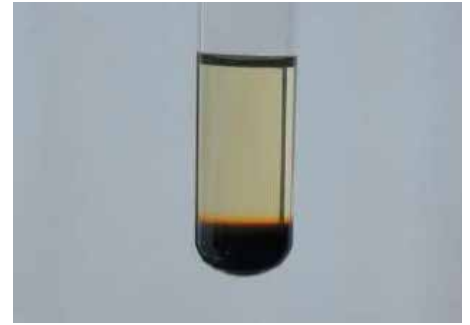


High-Temperature Stability

HELISOL® 5A from WACKER is a low-viscosity polydimethylsiloxane, a multi-component mixture of molecules with various molecular weights. The new heat-transfer fluid features very high heat resistance and durability. Transparent and odorless, it withstood temperatures up to 425 °C in long-term pilot tests conducted in Inner Mongolia. Not only that, but its pour point of below -55 °C is far lower than that of conventional heat-transfer fluids.



HELISOL® 5A: 14 days at 425 °C



BP/DPO: 14 days at 425 °C

Safety & Reliability

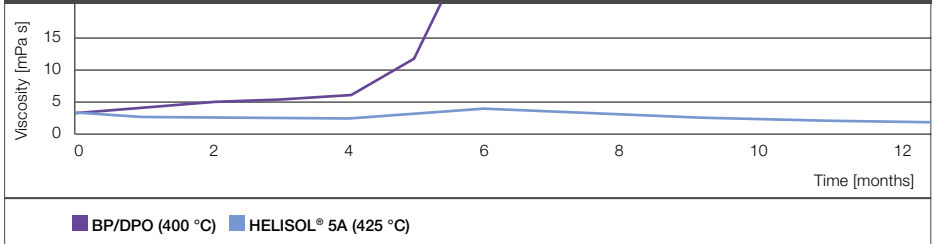
HELISOL® 5A achieved good results in the TÜV fire test:

- HELISOL® 5A combustion products are not classified as hazardous
- Ignition on a hot surface occurred above 475 °C
- The heat of combustion of HELISOL® 5A is approximately 20% lower compared to BP/DPO.
- Release experiments performed at a demonstration plant to simulate leakages at working temperature with an outlet diameter of two inch show no self-ignition of HELISOL® 5A.



Release test

Thermal Stability of HELISOL® 5A Compared to Organic Benchmark



Conclusion

Under specific test conditions, HELISOL® 5A offers greater heat resistance and durability than standard commercial products.

Advantages of HELISOL® 5A at a Glance

	BP/DPO	HELISOL® 5A
Operating temperature (CSP)	400 °C	425 °C
Freezing point/pour point	12 °C	< -55 °C
Vapor pressure (400 °C)	11 bar	16 bar
H ₂ formation		Reduced
Cp value	Higher	
Fouling	Yes	No
Specific cost of thermal energy storage (TES)		Lower

Conclusion

HELISOL® 5A offers outstanding advantages over conventional heat-transfer fluids.

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