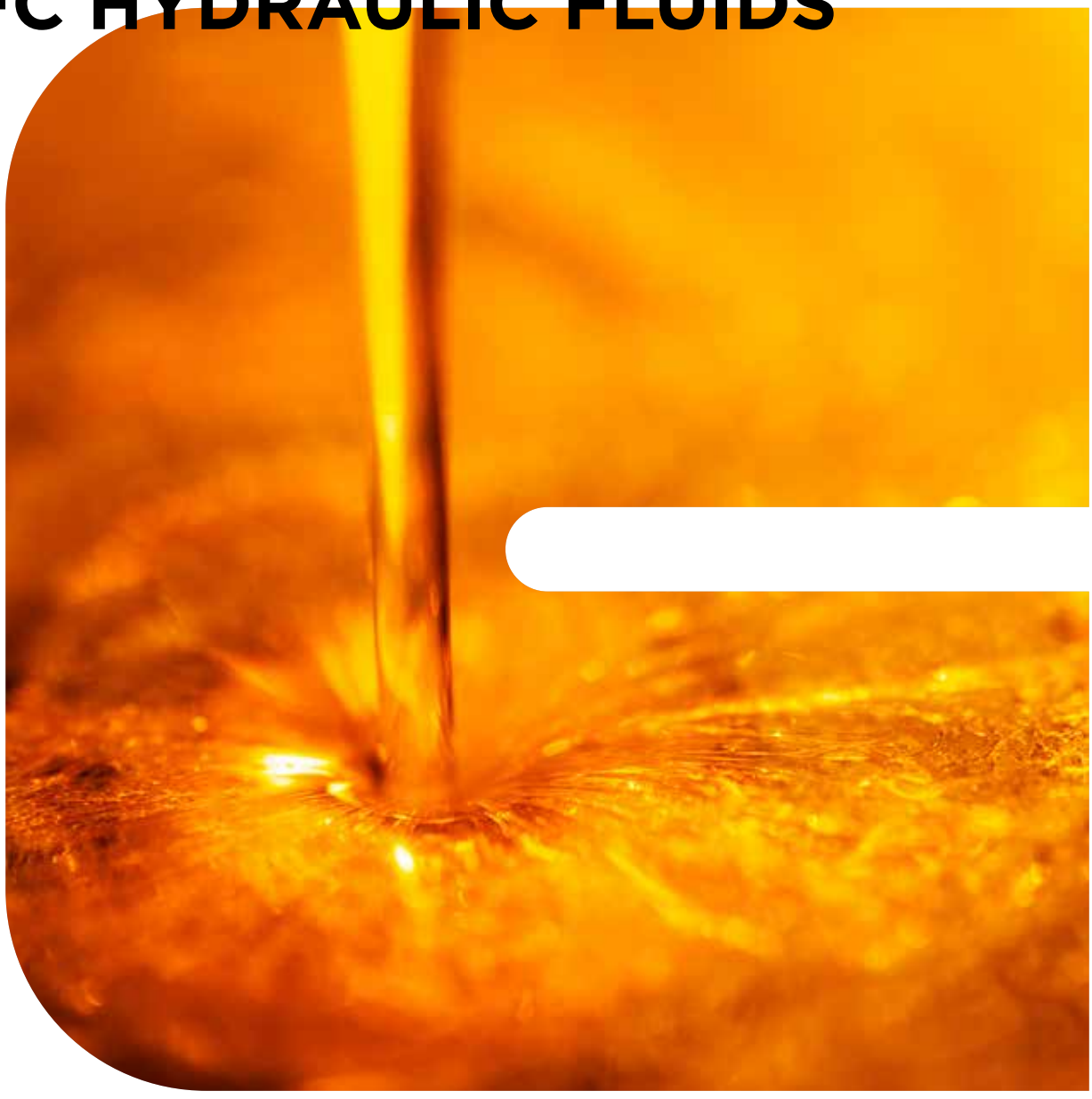
CLARIANT

Components for
HFC HYDRAULIC FLUIDS



what is precious to you?

Understanding HFC fluids
AND OUR CUSTOMERS' NEEDS

Clariant is a leading supplier of high-performance components and additives for fire-resistant hydraulic fluids.

HFC fluids are vital for many modern processes and must reliably perform under demanding conditions. We know that only by offering components with consistent high quality and stable properties can we guarantee a formulation's long-term performance and success.

We also know that the best way to start a lasting business relationship is by telling customers exactly what to expect. On these pages, you will find all important details on our range of high-performance products for HFC fluids – and the substantial benefits you can reap by using them.

MARKET TRENDS AND THEIR IMPACT ON THE REQUIREMENTS OF HYDRAULIC FLUIDS

Hydraulic machinery runs at increasingly higher speeds and pressures, combined with smaller oil reservoirs. To reduce downtime, fast release of entrained air, low foaming, excellent lubrication and long fluid lifetime must be ensured. At the same time, fluids must comply with increasingly stringent safety and toxicity regulations.

TRENDS FOR HYDRAULIC SYSTEMS		REQUIREMENT OF HYDRAULIC FLUIDS
EFFICIENCY	– Higher operational speeds of machines working with hydraulic fluids – Increased system pressure – Smaller oil reservoirs – Reduction of maintenance downtimes	▸ Fast air release of entrapped air in the hydraulic system ▸ Low foaming ▸ Improved lubrication of moving parts ▸ Increased fluid lifetime
SAFER USE & ENVIRONMENTAL FRIENDLINESS	– Minimization of fire hazards – Improving health & safety conditions for workers – Increasingly stringent safety requirements	▸ Reduced flammability ▸ Free of health hazard labels ▸ No/reduced toxicity of formulation ingredients

HFC HYDRAULIC FLUIDS: MAIN APPLICATIONS

In addition to efficient power transfer and lubrication, HFC fluids must provide reliable fire safety. They are used wherever there is risk that pressurized fluids leak from hydraulic systems and fire hazards exist. In these environments, the high water content of HFC fluids minimizes the risk of ignitions and their potentially disastrous consequences.

HFC fluids are mainly used in two areas:

- Heavy industry: steel-making, steel mills, foundries, forging plants, die casting
- Underground mining

As specified in ISO 7745, the typical working temperatures HFC fluids must be able to perform in range from 20 °C at start-up to +50 °C when machinery is running.

HFC HYDRAULIC FLUIDS: COMPOSITION

HFC hydraulic fluids are aqueous polymer solutions with a water content of at least 35%. Mainly the thickener used, but also the additive package has a crucial impact on how well they perform.

With our premium thickener Polyglykol D 41/40000 M 60 and our multifunctional additive Hostacor® HFC 100, we offer solutions that are precisely tailored to today's technical needs and optimize fluid performance as well as many other properties.

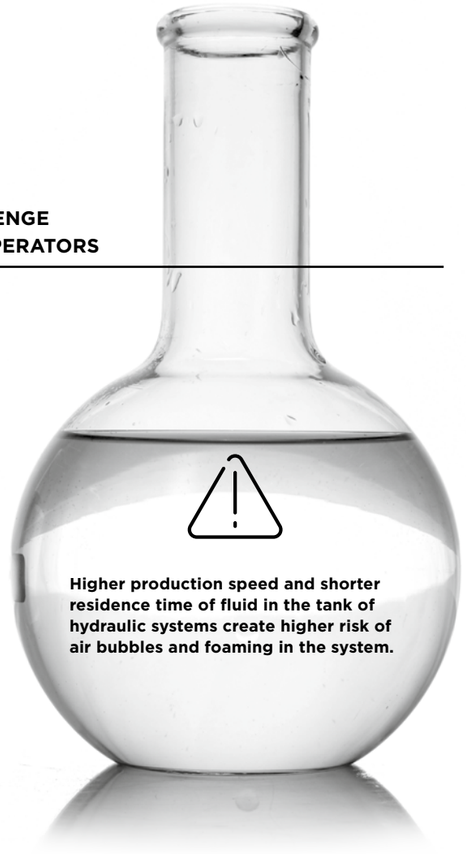
	COMPONENTS	OUR SOLUTION
ANTI-FREEZE	MONOETHYLENE GLYCOL/ DIETHYLENE GYCOL	
THICKENER	HIGH-VISCOSITY POLYGLYCOLS	☑ **Polyglykol D 41/40000 M 60**
BUFFERING SYSTEMS **CORROSION INHIBITORS** **ANTI-FOAM**	AMINES FATTY ACIDS SILICONE-FREE ANTIFOAMS	☑ **Hostacor HFC 100 Multifunctional Additive**
H_2O (> 35%)		

Why choosing the right thickener **MAKES ALL THE DIFFERENCE**

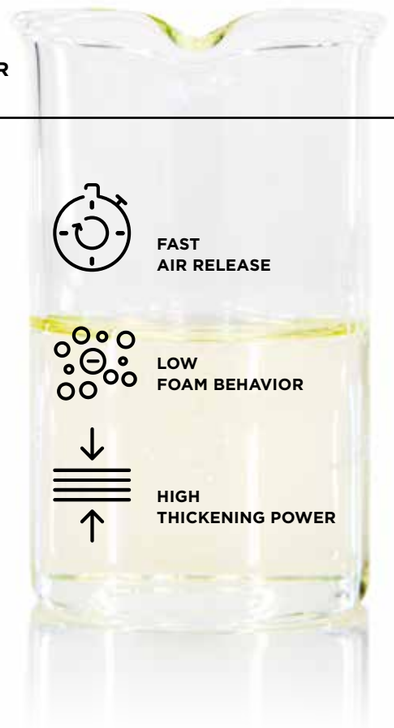
Operating hydraulic systems under today's technical conditions can be a challenge. Not only have hydraulic reservoirs become smaller. Higher production speeds also leave fluids less time to release air in these tanks, raising the risk of bubbles and foaming that can lead to loss of pressure and lubrication and cause overheating and noise creation.

In these conditions, choosing the right thickener makes all the difference. It is the crucial component of HFC hydraulic fluids, whose choice influences air release, foam behavior and thickening power – and with these, formulation cost.

CHALLENGE FOR OPERATORS



CUSTOMER NEED

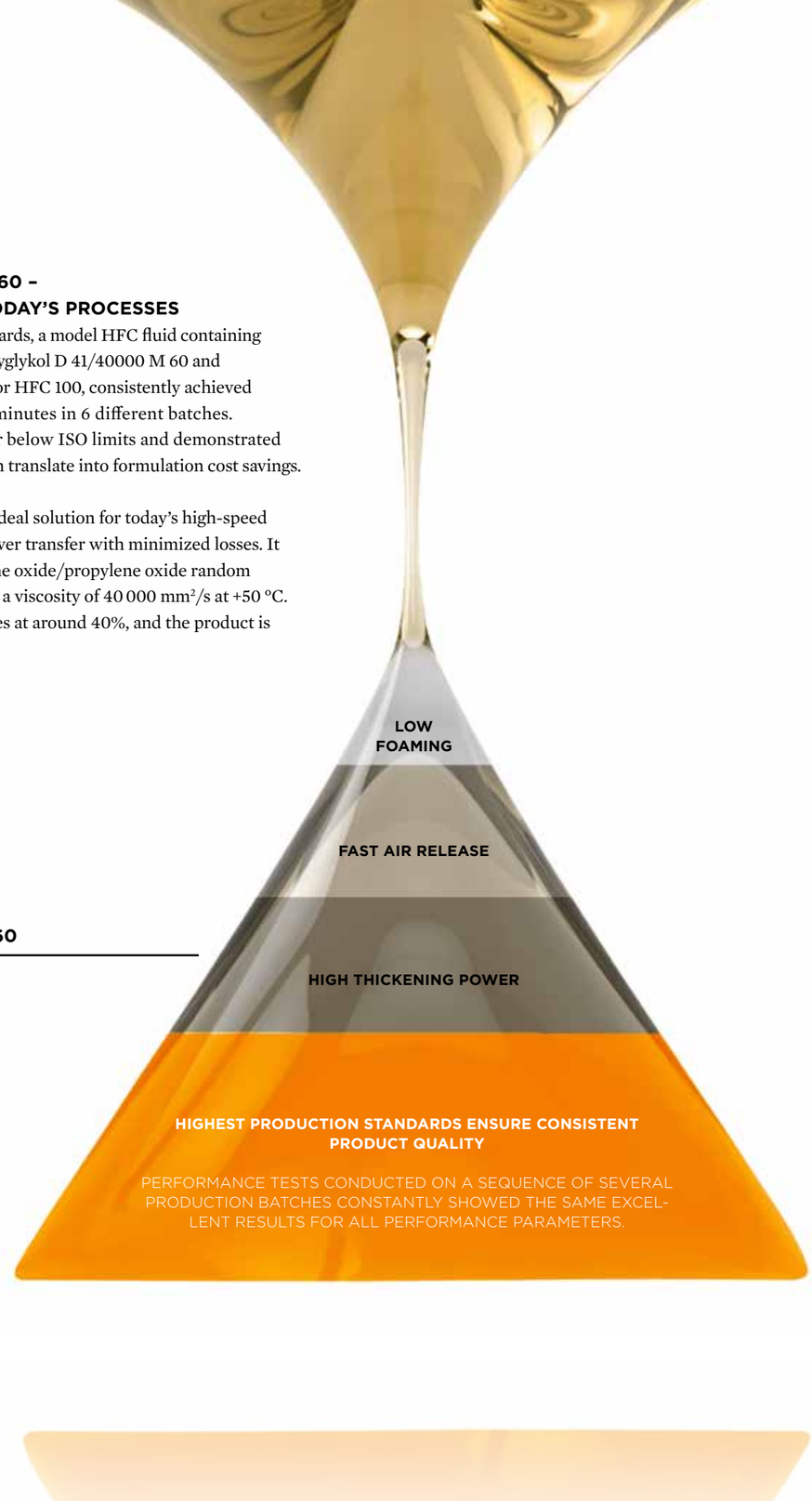


POLYGLYKOL D 41/40000 M 60 –
AN IDEAL SOLUTION FOR TODAY'S PROCESSES

In tests conducted under ISO standards, a model HFC fluid containing our high-performance thickener Polyglykol D 41/40000 M 60 and our multifunctional additive Hostacor HFC 100, consistently achieved an excellent air release time of 12 minutes in 6 different batches. It also showed foaming behavior far below ISO limits and demonstrated a superior thickening power that can translate into formulation cost savings.

Polyglykol D 41/40000 M 60 is the ideal solution for today's high-speed processes, combining optimized power transfer with minimized losses. It has an active content of 60% ethylene oxide/propylene oxide random copolymer that, in its pure state, has a viscosity of 40 000 mm²/s at +50 °C. The corresponding water content lies at around 40%, and the product is free of all hazard labels.

THE BENEFITS OF POLYGLYKOL D 41/40000 M60



A high-performing **COMBINATION**

Our multifunctional additive Hostacor® HFC 100 serves as the ideal complement to the highly efficient thickener and lubricant Polyglykol D 41/40000 M 60.

In the guide formulations we provide with these products, the combination yielded excellent performance data when tested against ISO 12922 (which we also provide to customers). Whether in terms of water content, pH, corrosion protection, foaming, air release or lubrication: Polyglykol D 41/40000 M 60 and Hostacor HFC 100 are a true dream team for enhancing the performance of HFC fluids.

GUIDE RECIPE	POLYGLYKOL D 41/40000 M 60 + Hostacor HFC 100
High water content/ low thickener*	✓
Low foaming	✓
Excellent air release properties	✓
High reserve alkalinity	✓
Good lubrication	✓

*Thickener content was adjusted to the lower third of ISO VG 46

ISO-COMPLIANT PERFORMANCE YOU CAN RELY ON

ISO 12922 – HFC		SPECIFICATION	TEST METHOD
Water content		min. 35%	ISO 6296
pH at 20 °C		6.7–10	ISO 20843
Corrosion protection	steel, copper, brass aluminium zinc	+5 to -11 mg +5 to -5 mg +5 to -22 mg	ISO 4404-1
Foaming		25 °C (300/10) 50 °C (300/10) 25 °C (300/10)	ISO 6247
Air release		max. 25 min	ISO 9120
Shear stability		175 bar, 250 cycles	ISO 20844
Elastomer compatibility		NBR 1	ISO 6072
Lubrication		Vane pump test (to be agreed) 4-ball machine (to be agreed) FZG gear test (to be agreed)	ISO 20763 ISO 20623 ISO 14635-1
Fire resistance		max. 30 s max. 60 s max. 60 s	ISO 15029-1 ISO 15029-2 ISO 14935

The right thickener **FOR EVERY NEED**

Clariant's range of thickeners for HFC fluids comprises four products with different viscosities and chemical architectures. While our newest product, Polyglykol D 41/40000 M 60, has diol as its starting molecule, the synthesis of our P 41 thickeners begins with pentaerythrol. The versatility of our range makes it easy for customers to pick the right thickener for their need.

All four products are label-free, show excellent foam behavior and have all relevant global registrations. Polyglykol P 41/3000 and P 41/12000 M 80 N are also just as easy to handle at room temperature as our new product. Polyglykol P 41/3000 can equal the newcomer in lubrication properties, in which the other pentaerythrol-based thickeners also provide solid results. P 41/12000 and its M 80 N version, which has 20% less active content, nearly match the new product in thickening power, and all P 41 products effect good, if not quite as excellent air release as our latest product.

CLARIANT'S RANGE OF THICKENERS FOR HFC HYDRAULIC FLUIDS

	POLYGLYKOL P 41/3000	POLYGLYKOL P 41/12000	POLYGLYKOL P 41/12000 M 80 N	NEW POLYGLYKOL D 41/40000 M 60
Starting molecule	PENTAERYTHROL			DIOL
Ratio EO/PO	4:1			
Viscosity at 50 °C for 100% active [mm^2/s]	approx. 3000	approx. 12000	approx. 12000	approx. 40000
Active content	100%	100%	80%	60%
CAS No.	58205-99-5			9003-11-6
Viscosity at 40 °C [mm^2/s]	5000	19000	4500	2600
Molecular weight (Mw) [g/mol]	15000	21000	21000	26000
Water content [%]	max. 0.5	max. 0.5	19.0 – 21.0	39.0 – 41.0

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