THE BASICS

What your oil really does

LUBRICATION 101

01

A lubricant is a machine component, not a consumable. Every litre in your system is working on five jobs at once — and when one of them slips, the others follow.

01
Reduces friction
A thin film keeps moving surfaces apart, so they slide on oil instead of on each other.

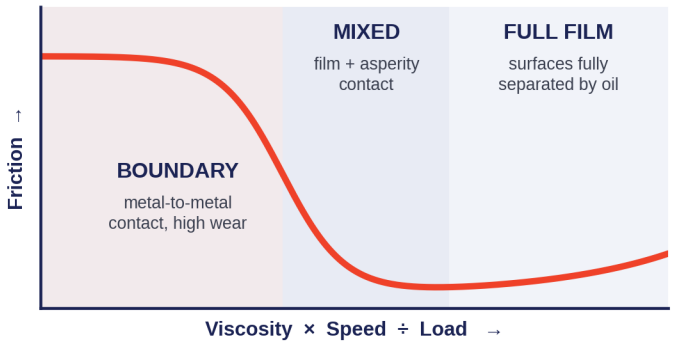
02
Limits wear
Anti-wear additives protect surfaces when the film thins — at start-up, low speed or shock load.

03
Removes heat
In circulating systems the oil carries heat away from bearings and gears to the cooler.

04
Controls contamination
Carries debris to the filter and separates water so it can be drained off.

05
Prevents corrosion
Rust and corrosion inhibitors protect metal surfaces, even while equipment stands idle.

THREE LUBRICATION REGIMES



Boundary — the film is too thin and surfaces touch. Wear is high and you depend on additives. Typical at start-up, low speed and heavy load.

Mixed — the film carries part of the load; some surface contact remains.

Full film — surfaces are completely separated. Friction and wear are at their lowest. This is the goal.

Viscosity, speed and load decide where you sit on the curve. Heat lowers viscosity and pushes you left.

WHY THE BASE OIL MATTERS

BASE OIL	TYPICAL STRENGTHS	WATCH-OUTS
Mineral	Lower cost, widely available, good general-purpose performance.	Lower viscosity index; less stable at high temperature; wax can limit low-temperature flow.
PAO (synthetic)	High viscosity index, excellent thermal and oxidation stability, flows in the cold, low volatility.	Low natural solvency, so it is usually blended with an ester.
Ester (synthetic)	Strong lubricant film, high thermal stability, natural solvency helps keep systems clean.	Can affect some seals and paints — check compatibility.

*REVO***SYN XP** is formulated with PAO and ester base oils plus proprietary additives — see the data sheet that follows.

VISCOSITY

Viscosity & VI explained

LUBRICATION 101

02

If you only get one thing right in lubricant selection, make it viscosity. Too thin and the film collapses; too thick and you pay for it in heat and wasted energy.

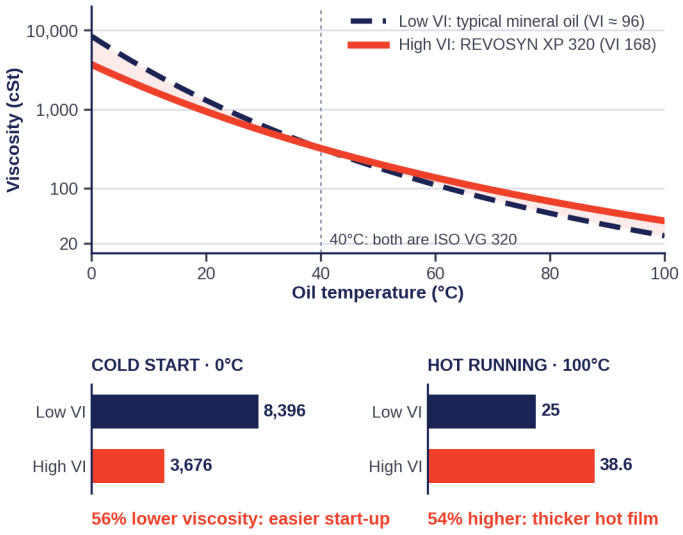
ISO VISCOSITY GRADES AND THE REVOLUTION RANGE

ISO VG	cSt @ 40°C (±10%)	REVOSYN XP	REVOCIRC	REVOCOMP	REVOPUMP	REVOCHARGE
15	13.5 – 16.5	●	–	–	–	–
22	19.8 – 24.2	●	–	–	–	–
32	28.8 – 35.2	●	●	●	●	●
46	41.4 – 50.6	●	●	●	●	●
68	61.2 – 74.8	●	●	●	●	●
100	90.0 – 110	●	●	●	●	●
150	135 – 165	●	●	●	●	–
220	198 – 242	●	●	–	–	–
320	288 – 352	●	●	–	–	–

VISCOSITY INDEX (VI): HOW MUCH OIL THINS WHEN IT GETS HOT

VI describes how much viscosity changes with temperature. A **higher VI** means the oil thins less when hot and thickens less when cold — so it holds a protective film at operating temperature and still flows at start-up.

- Mineral oils typically sit around VI 95–110. The Revolution range runs from about VI 115 to 168.
- Compare oils at the same ISO grade: the higher-VI oil keeps the thicker film at 100°C and the lower drag at 0°C.
- The grade on the drum is measured at 40°C — always think about your **operating** temperature.



ISO VG 320 example. High VI uses the REVOSYN XP 320 data-sheet values; low VI is a typical mineral oil (VI ≈ 96). Interpolated with ASTM D341.

RULE OF THUMB

Compare **cSt @ 100°C** as well as cSt @ 40°C. Two oils with the same ISO grade can behave very differently once they warm up.

BEARINGS

The kappa (κ) ratio

LUBRICATION 101

03

Kappa compares the viscosity your bearing actually sees with the viscosity it needs.

$$\kappa = \nu \div \nu_1$$

ν — actual oil viscosity at the bearing's operating temperature (cSt).

ν_1 — rated (required) viscosity for the bearing's size and speed.

STEP 1 — FIND THE VISCOSITY YOUR BEARING NEEDS

dm = (bore d + outside diameter D) ÷ 2 in mm; **n** = speed in rpm. Approximation (ISO 281 basis):

n ≥ 1,000 rpm	**$\nu_1 \approx 4{,}500 \div \sqrt{(n \times dm)}$**
n < 1,000 rpm	**$\nu_1 \approx 45{,}000 \div (n^{0.83} \times \sqrt{dm})$**

STEP 2 — READ THE RESULT

κ < 0.4
BOUNDARY
Surfaces are in contact. High wear risk.

0.4 – 1
MIXED
Partial contact. Use anti-wear / EP-additised oil or raise viscosity.

1 – 4
FULL FILM
Target zone. Aim for 2 or more for a comfortable margin.

κ > 4
EXCESS
No extra bearing life. More drag, heat and energy loss.

WORKED EXAMPLE

Bearing with dm = 100 mm running at 1,500 rpm: **$\nu_1 = 4{,}500 \div \sqrt{(1{,}500 \times 100)} \approx 11.6$ mm²/s.**

OIL	ν @ 60°C	κ @ 60°C	ν @ 80°C	κ @ 80°C
Typical mineral ISO VG 46 (VI ≈ 100)	20.6	1.8	11.1	0.96
46-grade synthetic (VI 136)	22.1	1.9	12.4	1.07
68-grade synthetic (VI 135)	31.0	2.7	16.7	1.4

At 80°C the mineral oil slips below κ = 1 while the higher-VI synthetic only just clears it — one grade up gives real margin.

If κ is below 1: run cooler (clean the cooler, check airflow, reduce load), step up one ISO grade, or choose a higher-VI oil. **Good practice:** use the temperature at the bearing — often hotter than the sump — and confirm against the OEM recommendation.

Viscosities calculated from 40°C / 100°C values (ASTM D341). Mineral figures are typical values; synthetic figures use the REVOCIRC / REVOCOMP / REVOPUMP data sheets.

CONDITION

Keep it clean, cool & dry

LUBRICATION 101

04

Most lubricant failures are caused by what gets into the oil: particles, heat and water.

CLEAN

ISO 4406

A three-number code for particles ≥ 4, ≥ 6 and ≥ 14 µm per mL; each step doubles the count. Set a target per machine, then filter to reach it. Typical targets (confirm with the OEM):

- Critical: 15/13/10–16/14/11
- General: 17/15/12–18/16/13
- Robust: 19/17/14–20/18/15

COOL

+10°C

As a rule of thumb, oxidation rate roughly doubles for every 10°C rise (above about 60–70°C), halving oil life. Heat is a major driver of varnish and sludge.

- Keep coolers clean; check bypass valves
- Measure at the bearing or return line, not just the sump

DRY

500 ppm

A common alarm level for circulating oils (0.05%). Aim lower for critical bearings. Cloudy or milky oil means free water — always a red flag.

- Fit desiccant breathers
- Fix leaking seals and cooler tubes
- Trace condensation to its source

SAMPLING THAT TELLS THE TRUTH

01 Same point, same way
Trends matter more than any single result. Act on the direction of travel.

02 Live zone, at temperature
Sample while running (or just after shutdown) from a turbulent zone — not the sump bottom or a dead leg.

03 Flush, then fill
Flush the sample port first; use a clean, dedicated bottle every time.

04 Label and send promptly
Machine, oil, hours, date and top-up history. Water and particle results drift with time.

WHAT EACH TEST TELLS YOU

TEST	WHAT IT TELLS YOU
Viscosity @ 40°C	Wrong oil added, oxidation (thickening) or dilution (thinning).
Acid number (TAN)	Oxidation and additive depletion — a rising trend means ageing oil.
Water (Karl Fischer, ppm)	Moisture ingress; compare against your alarm limit.
Particle count (ISO 4406)	Cleanliness against target; how well filtration is working.
Elemental analysis (ICP)	Wear metals and additive levels; rising iron or copper flags wear.
Varnish potential (MPC)	Soft-contaminant and varnish risk — before it shows up as sticking valves.

Varnish or sticky valves? See the *REVO***SOLV VR** data sheet. Depleted additives in otherwise sound oil? See *REVO***CHARGE**.

FIELD GUIDE

Field habits & fixes

LUBRICATION 101

05

Ten small habits that prevent most lubrication problems, followed by a cheat-sheet for the symptoms you are most likely to meet on the plant floor.

TEN HABITS OF RELIABLE LUBRICATION

01 Match viscosity to temperature
Select for operating temperature, not the nameplate default. For bearings, check κ.

02 Don't mix oils casually
Even compatible oils dilute each other's performance. Drain, flush and refill where you can.

03 Fill to the mark
Overfilling churns and heats the oil; underfilling starves the film.

04 Dedicate and label
One colour-coded container, funnel and hose per oil type.

05 Filter new oil
Oil straight from the drum is often dirtier than your target. Filter it on the way in.

06 Fit desiccant breathers
Stop moisture and dust entering with every temperature cycle.

07 Store smart
Sealed, under cover, drums on their sides with bungs at 3 and 9 o'clock. First in, first out.

08 Top up with the same oil
Log every top-up — rising consumption is a leak clue.

09 Don't judge by colour
Dark oil is not always bad and clear oil is not always good. Test it.

10 Fix the cause
Repeated water, heat or contamination is a machine problem, not an oil problem.

QUICK TROUBLESHOOTING

SYMPTOM	LIKELY CAUSES	FIRST CHECKS
Oil running hot	Viscosity too high or too low; over- or under-filled; fouled cooler; misalignment or overload.	Compare bearing and sump temperature; check level, cooler performance and κ.
Milky or cloudy oil	Water ingress: seals, breather, cooler leak, condensation or wash-down.	Crackle test or Karl Fischer; inspect breather and cooler; drain free water.
Foaming	Air ingress, overfilling, contamination, depleted anti-foam, poor return-line layout.	Check for suction leaks, oil level and return-line position; test oil condition.
Dark or burnt smell	Overheating, oxidation or contamination.	Trend acid number and viscosity; find the heat source; consider a change.
Sludge, varnish, sticking valves	Oxidation by-products, hot spots, repeated cold-start cycling.	Test varnish potential (MPC); look for hot spots. See the REVOSOLV VR data sheet.
Bearing noise or vibration	Film breakdown (low κ), contamination, misalignment.	Check κ, particle count, oil level and temperature.

DATA SHEETS

Reading a data sheet

LUBRICATION 101

06

The property table on each product page is compact, but every line tells you something practical. Here is what each one means and what to look for.

PROPERTY	WHAT IT IS	WHAT TO LOOK FOR
cSt @ 40°C (ASTM D445)	Kinematic viscosity at 40°C. Defines the ISO VG grade.	Match the grade to the OEM recommendation and your operating temperature.
cSt @ 100°C	Viscosity when hot.	Higher for a given grade means a thicker film at temperature.
Viscosity Index (ASTM D2270)	How much viscosity changes with temperature.	Higher is better; above about 120 is considered high.
Flash Point (ASTM D92)	Lowest temperature at which vapours ignite.	A safety and volatility guide — keep well above operating temperature. Not a service limit.
Pour Point (ASTM D97)	Lowest temperature at which the oil still flows.	Keep at least 10°C below your coldest start-up temperature.
Specific Gravity	Density relative to water.	Converts litres to kilograms — a 208 L drum at 0.86 weighs about 179 kg.
D-130 Copper Corrosion	Effect on a copper strip (3 hrs and 250 hrs at 210°F).	1A is the best rating. Matters for bronze cages and copper coolers.
D-665 Rust Test	Steel rod in oil mixed with fresh or salt water.	PASS means no rust formed.
D-892 Foam Sequence II	How much foam forms, and how long it lasts.	0 means no foam formed; lower is better.

THREE-SECOND SANITY CHECKS

- Is the pour point well below your coldest start?
- Is the flash point well above your hottest surface?
- Are you comparing like with like — same test method, same temperature?

NOT ON THE SHEET

- OEM approvals and equipment builder recommendations.
- Seal and paint compatibility.
- Compatibility with the oil already in the system.

NEXT

Turn the page for the full data sheets: *REVO***SYN XP** · *REVO***CIRC** · *REVO***COMP** · *REVO***PUMP** · *REVO***SOLV VR** · *REVO***CHARGE**