



FRICTION MACHINE TEST REPORT · 304 HOURS

Steel–cast iron friction pair: surface defect filled in, friction dropped manyfold

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Kharkiv, Ukraine · report approved 28.01.2002 · bench running time 304 h

PRODUCT	TEST OBJECT	DOCUMENT TYPE
XADO revitalizant, Gel for Compressors and Bearings TU U 25612000.001-99 · 0.2 % additive in IGP-30 oil	Steel–cast iron friction pair ST40Kh disc, GOST 4543-71 — SCh-20 block, GOST 1412-85 · MI-type friction machine	Report of the Research Department of JSC KhTZ, signed and stamped

SPECIMEN / UNIT	INITIAL CONDITION AND TEST MODE	WHAT WAS MEASURED
ST40Kh disc, Ø 59.703–59.705 mm	Helical groove 0.2 mm deep, cut with a tool bit; roughness Ra 1.1–1.2	Groove depth at three points, roughness, diameter, weight
SCh-20 block, 10 × 20 mm	Sliding friction, disc-on-block scheme, IGP-30 oil	Friction torque and friction coefficient of the pair
Bench mode	200 rpm, load on the block in steps of 50–200 kg	304 h of running, eight intermediate measurements

The defect was introduced deliberately: before the test, a helical groove 0.2 mm deep was cut with a tool bit on the working surface of the disc.

Key results

↑ **76-95 %**

filling of the artificial groove, depth
0.2 → 0.009-0.048 mm

↓ **11×**

friction coefficient of the steel-cast
iron pair, 0.121 → 0.011

↓ **12-15×**

roughness of the friction surface, Ra
1.2 → 0.08-0.1

Defect filling, roughness and friction over the running time

RUNNING TIME	GROOVE DEPTH, MM · P.1 · P.2 · P.3	ROUGHNESS Ra	FRICTION COEFFICIENT
Initial	0.2 · 0.2 · 0.2	1.2	0.121
21 h	0.187 · 0.195 · 0.195	0.75–0.85	0.113
70 h	0.105 · 0.130 · 0.154	0.6–0.65	0.112
113 h	0.022 · 0.010 · 0.080	0.5–0.55	0.103
139 h	0.0195 · 0.0095 · 0.055	0.4–0.45	0.096
169 h	0.018 · 0.0095 · 0.055	0.25–0.35	0.071
206 h	0.016 · 0.009 · 0.055	0.15–0.22	0.047
261 h	0.018 · 0.0093 · 0.048	0.1–0.14	0.019
304 h	0.018 · 0.009 · 0.048	0.08–0.1	0.011

Point 3 is at the edge of the disc, where there is no intensive friction: the layer builds up where the work is done. Measurements — MIS-11 microscope, Surtronic roughness tester, MI friction machine.

With and without XADO revitalizant — control comparison

PARAMETER	IGP-30 OIL + 0.2 % XADO	IGP-30 OIL WITHOUT ADDITIVE
Friction coefficient	0.121 → 0.011 — 11×	0.123 → 0.048 — 2.5×
Surface roughness Ra	1.2 → 0.08–0.1 — 12–15×	1.1 → 0.3–0.25 — 3.6–4.4×

Running-in reduces friction by itself, but with the revitalizant the final friction is four times lower than in the control — 0.011 against 0.048.

Disc geometry and weight over 304 hours

DISC PARAMETER	BEFORE THE TESTS	AFTER 304 H
Outer diameter	59.703–59.705 mm	59.700–59.702 mm
Disc weight	200.1850 g	200.1543 g

According to the report's conclusions, the actual weight loss of the disc is 0.0305 g against a calculated 0.0219 g; this comparison is the basis for the conclusion that a layer is formed.

Conclusions of the JSC KhTZ report

The Research Department of JSC KhTZ recorded:

1. The artificial recess (helical groove) on the friction surface is filled with metal ceramics, which testifies to the ability of XADO revitalizants to restore damaged and worn rubbing surfaces.
2. As a result of the layer formation, the friction coefficient decreased **11×** (from 0.121 to 0.011); without XADO revitalizant — **2.5×** (from 0.123 to 0.048).
3. The surface roughness decreased **12-15×** (from Ra 1.2 to Ra 0.08-0.1); without XADO revitalizant — **3.6-4.4×** (from Ra 1.1 to Ra 0.3-0.25).
4. The use of XADO revitalizants as an additive to IGP-30 oil in an amount of 0.2 % significantly improves the tribotechnical characteristics of the steel–cast iron friction pair, which makes it possible to increase the wear resistance of the rubbing surfaces.

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The results were obtained on a model steel–cast iron friction pair (ST40Kh disc — SCh-20 block) on an MI-type friction machine with a 0.2 % additive in IGP-30 oil; on units in service the figures may differ. The original JSC KhTZ report of 28.01.2002 with signatures and stamp is published in full and available for download.