TECHNICAL BULLETIN

JLR Ingenium Chain

MATERIAL ANALYSIS AND PERFORMANCE TESTING

Scope: To clearly determine the differences and similarities between an FAI chain and its OE equivalent regarding application suitability. The comparison focuses on element analysis—including bush, inner plate, outer plate, and pin—and aims to provide definitive results. A metallography study and a wear report form part of the evaluation. All testing was carried out in a laboratory setting using calibrated, industry-standard equipment.

Application: Jaguar / Land Rover 2.0 d 204DTA (AJ20D4) Ingenium 2015>
Contained in FAI ref: TCK357, TCK357WO, TCK357VVT
Chain Links: 90
Chain Pitch: 9.525

Conclusion summary: The FAI and OE chains were comparable and passed the battery of tests. Due to manufacturing techniques and coatings used, small differences are detectable. The details of which are provided within this document. The functionality and longevity of the FAI chain sit within tolerances that align with the OE sample.

Element analysis: The FAI and OE chain components were found to be comparable, with small differences attributable to manufacturing techniques or materials used in FAI wear-resistant coatings. The intended use and functionality of the FAI chain are considered to match those of the OE specifications.

Element - Bush

FAI

Material analysis

Analysis items	Analysis result%	unit
C	0.296↑	%
Si	0.520↑	%
Mn	0.964↑	%
P	0.028	%
S	0.011	%
Cr	0.732↑	%
Ni	0.486	%
Mo	0.226	%
Cu	0.090	%

OE

Material analysis

Analysis items	Analysis result%	unit
C	0.294↑	%
Si	0.466↑	%
Mn	0.991↑	%
P	0.022	%
S	0.025	%
Cr	0.677	%
Ni	0.574	%
Mo	0.233	%
Cu	0.091	%

Element	C	Si	Mn	P	S	Cr	Ni	Mo	Cu
FAI	0.296	0.520	0.964	0.028	0.011	0.732	0.486	0.226	0.090
OE	0.294	0.466	0.991	0.022	0.025	0.677	0.574	0.233	0.091
Deviation	0.68%	11.59%	-2.72%	27.27%	-56.00%	8.12%	-15.33%	-3.00%	-1.10%

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MATERIAL ANALYSIS AND PERFORMANCE TESTING

Element Analysis - Continued

Element - Inner Plate

FAI

Material analysis

Analysis items	Analysis result%	unit
C	0.450	%
Si	0.337	%
Mn	0.969	%
P	0.021	%
S	0.005	%
Cr	0.162	%
Ni	0.021	%
Cu	0.028	%

OE

Material analysis

Analysis items	Analysis result%	unit
C	0.507 ↑	%
Si	0.317	%
Mn	0.970	%
P	0.019	%
S	0.009	%
Cr	0.180	%
Ni	0.022	%
Cu	0.027	%

Element	C	Si	Mn	P	S	Cr	Ni	Cu
FAI	0.45	0.337	0.969	0.021	0.005	0.162	0.021	0.028
OE	0.507	0.307	0.97	0.019	0.009	0.18	0.022	0.027
Deviation	-11.24%	9.77%	-0.10%	10.53%	-44.44%	-10.00%	-4.55%	3.70%

Element - Outer Plate

FAI

Material analysis

Analysis items	Analysis result%	unit
C	0.450	%
Si	0.337	%
Mn	0.969	%
P	0.021	%
S	0.005	%
Cr	0.162	%
Ni	0.021	%
Cu	0.028	%

OE

Material analysis

Analysis items	Analysis result%	unit
C	0.507 ↑	%
Si	0.317	%
Mn	0.970	%
P	0.019	%
S	0.009	%
Cr	0.180	%
Ni	0.022	%
Cu	0.027	%

Element	C	Si	Mn	P	S	Cr	Ni	Cu
FAI	0.45	0.337	0.969	0.021	0.005	0.162	0.021	0.028
OE	0.507	0.307	0.97	0.019	0.009	0.18	0.022	0.027
Deviation	-11.24%	9.77%	-0.10%	10.53%	-44.44%	-10.00%	-4.55%	3.70%

MATERIAL ANALYSIS AND PERFORMANCE TESTING

Metallography: The FAI and OE chain bushes were found to be comparable in thickness. The hardness test showed that the FAI chain had a very high tensile strength. The OE sample was slightly harder, adding 3% to the FAI sample. A score of 766 HB found in the FAI sample is considered more than adequate for the application. The Inner and outer plates were tested for decarburization. Both were deemed comparable, but the FAI sample did show residual amounts of Banite, Martensite, and Austenite. However, the presence of these metal compounds does not cause any detrimental effects during the chain's operation. The pin characteristics differ from the FAI to the OE sample due to the technical approach and heat treatments. The comparison of the pins is better explained in results of the wear resistance testing.

Metallography - Bush

Item	layer thickness	Hardness
FAI	0.18	766
OE	0.18	791
Deviation	0%	-3.16%

Metallography - Inner Plate

Item	Form of organization	Decarburized layer
FAI	Acicular lower bainite and martensite + a small amount of retained austenite	Acicular lower bainite and martensite + a small amount of retained austenite
OE	No decarburization observed	No decarburization observed
Deviation	None	None

Metallography - Outer Plate

Item	Form of organization	Decarburized layer
FAI	Acicular lower bainite and martensite + a small amount of retained austenite	Acicular lower bainite and martensite + a small amount of retained austenite
OE	No decarburization observed	No decarburization observed
Deviation	None	None

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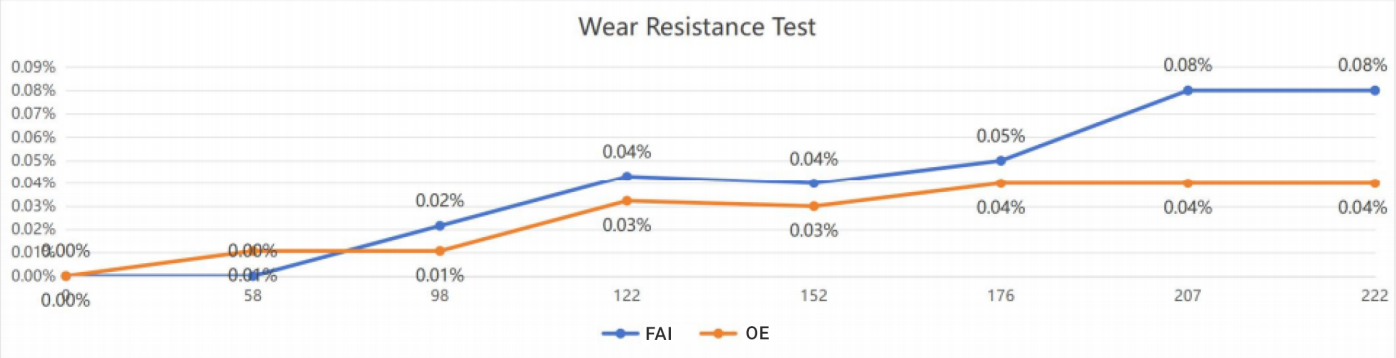
MATERIAL ANALYSIS AND PERFORMANCE TESTING

Wear resistance: The FAI and OE chains were tested for a 200 hour period. Our testing concluded that the FAI chain was comparable with the OE sample. Both chains experienced very slight chain stretch, which is expected of any chain, with the FAI chain producing a slightly higher figure. Both were comfortably within expected levels.

Chain Wear Resistance Test Report

Test Date			2025.11.28			Chain type	Bush Chain			Chain model	06DNF5		
Test Purpose			Compare ware resistance			Engine oil condition	OW20 + 5% Gasoline + 5% Water + 2% Carbon Black			Report Number	/		
Speed（r/min）			2000r			Load	2800N-Both sides			Lubrication			
Test Equipment			Equipment2			Teeth Number	19-38T			Link Number	86L		
Test Status			NO.1	Spliced Chain			Verification Point：Compare the Chain's Wear Elongation						
Time（h）			0	58	98	122	152	176	207	222			
1	Elongation	FAI	185.56	185.56	185.60	185.64	185.64	185.66	185.70	185.70			
		OE	185.68	185.70	185.70	185.74	185.74	185.76	185.76	185.76			
	Elongation	FAI	0.00%	0.00%	0.02%	0.04%	0.04%	0.05%	0.08%	0.08%			
		OE	0.00%	0.01%	0.01%	0.03%	0.03%	0.04%	0.04%	0.04%			



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