QSEAL PRODUCT STANDARD AND TESTING FINAL REPORT

TEN AUTOMOTIVE PARTS

JULY 2008 – B2TKS TESTING HOUSE

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1. INTRODUCTION

Automotive component testing is one of the most important factors in assessing the quality of components. There are a lot of OEM, Genuine, KW 1, KW 2 and other components available in the market, particularly to meet the need for the substitutes of fast-moving and slow-moving components. In order to protect the customers and to know the technical quality of the available components, several tests need to be performed on the aforementioned components.

There are some standards generally applied by manufacturers for the purpose of testing process, such as SAE, JASO, ASTM standards and the like. However, in this case, manufacturers apply standards developed themselves, which involve highly confidential test methods and are difficult to be obtained. On the other hand, cost factor constitutes a part of the considerations. Therefore, in order to obtain data regarding the quality of components available in the market, some comparative tests need to be performed by using genuine components as the reference. The tests should focus on directly comparable technical parameters, such as material quality, by conducting static test and hardness test on the materials. It is because, technically, there is a significant relation between component quality and the material used. Both SAE and JASO standards also describe that material test on the aforementioned components are highly required. As previously described, the acceptance criteria are only set in the standards developed by respective manufacturers, which are strictly confidential. Therefore, the option to compare the quality of genuine and after-market components is expected to provide an overview on the automotive components available in the market.

2. PURPOSE

The main purpose of the tests was to obtain a comparative overview with respect to the components available in the market.

3. TEST OBJECTS

The test objects or spare parts were purchased directly from spare part stores. Genuine spare parts were bought from authorized dealers such as *Bengkel AHAS*, Auto 2000, while after-market spare parts were bought from spare part stores.

4. TEST METHOD

The Tests were conducted using the methods set forth in the generally applied standards of the automotive industry such as SAE and JASO. With respect to the test methods in the aforementioned standards, the following are the tests performed on the test objects:

4.1 TEST OBJECTS AND TEST METHODS

No	Test Object	Method	Remarks
1	Chain and Sprocket	JIS 1801 /JASO 103	Material, tensile and hardness tests
2	Rubber (Damper)	ASTM D 395 / D412 /D429	Compression, Hysterisis and Specific Weight tests
3	Brake Shoe	SAE J109a/ 379 /380	Specific weight, Hardness, Bonding shear and dynamics tests
4	Motorcycle Muffler	SAE J 1492/ISO 5130	Material, hardness and mechanical tests
5	Gasket	SAE J 90 b	Mechanical and physical tests, thickness, conditioning and tensile tests
6	Car Muffler	SAE J 1492/ISO 5130	Material, hardness and mechanical tests
7	Fuel Filter	SAE J1124	Material, dimension, pressure drop, filter element tests
8	Oil Filter	JASO E 302	Material, dimension, pressure drop, filter element tests
9	Air Filter	SAE J 1599	Material, dimension, pressure drop, filter element tests

5. TEST RESULTS

The test results of each component tested are presented in a separate report (attached).

6. COMPARATIVE TEST RESULTS

6.1. CHAIN AND SPROCKET

Description	AHM Product		Indopart Product	
Weight - Chain - Large Sprocket - Small Sprocket	 887 gram 639.8 gram 125.5 gram		 934.9 gram 604.3 gram 128.3 gram	
Tensile Test Results				
- Test Object 1	19.2 kN		20.4 kN	
- Test Object 2	19.8 kN		20. 2 kN	
- Test Object 3	19.6 kN		20.6 kN	
Hardness test on Back Sprocket (HV) at 10 spots downward	Tooth 712 699 642 665 602 593 232 227 232 330	Tooth root 699 642 244 232 232 225 232 222 206 210	Tooth 750 722 687 687 655 645 450 404 250 300	Tooth root 755 722 280 280 250 280 254 250 230 230
Hardness test on Front Sprocket (HV) at 10 spots downward	Tooth 840 855 855 873 855 840 840 840 825 825	Tooth root 855 892 892 892 873 873 855 855 855 840	Tooth 855 855 840 840 890 850 814 820 820 820	Tooth root 890 892 892 860 870 873 860 850 850 850

The test results indicated that Indopart products, namely chain and sprocket, were stronger and harder, respectively, compared to AHM products. In addition to that, Indopart products were slightly heavier than AHM products for the same dimension.

6.2. RUBBER DAMPER

Description	AHM Product	Nissin Product
- Weight	28.0 gram/pc	28.4 gram/pc
- Deflection under the load of 13.75 kN	6.2 mm	6.1 mm
- Deflection under the load of 2.5 kN after the load was reduced	3.5 mm	3.0 mm

The specific weight of Nissin rubber damper was slightly heavier than AHM product and at the same pressure load, it was able to release load faster (smaller hysteresis).

6.3. BRAKE SHOE

Description	AHM Product	YXSZD Product	Federal Product
- Weight	200.3 gram		
- Tensile Test (HB)	Testing point 1 = 50 Testing point 2 = 50 Testing point 3 = 40 Average = 46.6	Testing point 1 = 30 Testing point 2 = 40 Testing point 3 = 40 Average = 36.6	Testing point 1 = 67 Testing point 2 = 57 Testing point 3 = 57 Average = 60.6
- Bonding Shear Test	11.25 kN	18.75 kN	11.1 kN
- Dynamics Test After 3 x 1.5 hours of dynamics test	Initial temperature 29^{0}C Final Temperature 97^{0}C Thinning 0.12 mm Hardness increase Testing point 1 = 67 Testing point 2 = 81 Testing point 3 = 69 Average = 72.3	Initial Temperature 29^{0}C Final Temperature 117^{0}C Thinning 0.17 mm Hardness increase Testing point 1 = 70 Testing point 2 = 76 Testing point 3 = 82 Average = 76	Initial Temperature 29^0 C Final Temperature 102^{0}C Thinning 0.15 mm Hardness increase Testing point 1 = 82 Testing point 2 = 84 Testing point 3 = 86 Average = 84

The hardness of the test objects increased following one-hour dynamics test under the same test load. The increased hardness was also followed by increased fragility of the brake shoes. The brake shoe made by YXSZD had the highest thinning rate (0.17 mm), followed by Federal product (0.15 mm) and AHM product (0.12 mm). With respect to temperature increase after one-hour friction, the temperature of YXSZD product increased up to 1070 C, while the temperature of Federal product and AHM product increased up to 1020 C and 970 C, respectively, at the relatively same room temperature of 290 C.

6.4. MOTORCYCLE MUFFLER

Description	AHM Product	KW 1 Product
- Weight	1.78 kg/pc	1.9 kg/pc
- Hardness Test (HB)	Testing point 1 = 204 Testing point 2 = 210 Testing point 3 = 206 Average = 206.3	Testing point 1 = 200 Testing point 2 = 202 Testing point 3 = 204 Average = 203
- Tensile Test	Test Object 1 = 17 kN Test Object 2 = 18.5 kN Test Object 3 = 18.75 kN	Test Object 1 = 16.87 kN Test Object 2 = 16.8kN Test Object 3 = 14 kN

Physically, there was no significant difference between AHM product and KW 1 product with respect to the strength, hardness or thickness of the material used.

6.5. MOTORCYCLE GASKET

Description	AHM Product	KW 1 Product/Honda
- Weight - Thickness	9.3 gram 0.7 mm	11.1 gram 0.7 mm
- Weight at the conditioned temperature of 100^{0}C	9.0 gram	9.7 gram
- Tensile Test	Test Object 1 = 40 N Test Object 2 = 90 N Test Object 3 = 112 N	Test Object 1 = 30 N Test Object 2 = 80 N Test Object 3 = 90 N

Specifically, the specific weight of AHM gasket was lighter than KW1 Product/Honda. However, at the conditioned temperature of 1000C for 1 hour, there was significant decrease in the weight of KW 1 Product, while the weight of AHM Product decreased only by 0.3 gram. The tensile test on AHM gasket indicated a better result compared to that of KW 1 for the same size and dimension.

6.6. CAR MUFFLER

Description	Toyota Product		Galvanized KW 1 Product		KW 1 Product	
- Weight - Plate thickness	12.5 kg 1.2 mm		13.02 kg 1.27 mm (galvanized)		12.1 kg 1.01 mm	
- Hardness Test (HB)	Plate 85.4 85.1 83.6	Pipe 147 147 150	Plate 84.1 84.7 85	Pipe 149 148 150	Plate 83.7 84.2 84.1	Pipe 149 147 148
- Tensile Test on 30 mm-width specimen	Test Object 1 = 15 kN Test Object 2 = 14.2 kN Test Object 3 = 15.1 kN		Test Object 1 = 16.2 kN Test Object 2 = 16.5 kN Test Object 3 = 16.8 kN		Test Object 1 = 12 kN Test Object 2 = 12.4 kN Test Object 3 = 12.2 kN	

There was quite significant difference in the tensile capacity of the materials of the mufflers. However, after further evaluation based on the effective area of the section for tensile test, it was evident that the tension on the materials was relatively similar although the thickness of the materials used in Toyota (genuine), galvanized KW 1 and non-galvanized KW 1 products were different.

6.7. FUEL FILTER

No	Description	Toyota Product	KW 1 Product
1	Material	Plastic	Plastic
2	Wall thickness	1.2 mm	1.2 mm
3	Filter material	Paper	Paper
4	Weight	43.3 gram	47 gram
5	Pressure test/pressure drop	70 % at 1 atm	70 % at 1 atm

There was no significant difference between Toyota product and KW 1 product, except for the writing on the filters. The writing on the KW 1 product was less smooth compared to that of Toyota product.

6.8. OIL FILTER

No	Description	Toyota Product	KW 1 Product (Thailand)
1	Material	Plate	Plate
2	Wall thickness	0.5 mm	0.5 mm
3	Filter Material	Paper	Paper
4	Weight	273.1 gram	264 gram
5	Pressure test/pressure drop	66 % at 1 atm	65 % at 1 atm

There was no significant difference between Toyota product and KW 1 product, except for the writing on the filters. The writing on the KW 1 product was less smooth compared to that of Toyota product and it read "Made in Thailand".

6.9. AIR FILTER

No	Description	Toyota Product	KW 1 Product
1	Material	Paper and Plate	Paper and Plate
2	Wall thickness	0.5 mm	0.5 mm
3	Filter Material	Paper	Paper
4	Weight	325.4 gram	326 gram

There was no significant difference between Toyota product and KW 1 product, except for the writing on the filters. KW 1 product had less writing compared to that of Toyota product.

6.10. CONCLUSIONS/SUGGESTIONS/RECOMMENDATIONS

Conducting comparative tests on automotive spare parts by referring to SAE, JASO or other standards is not a simple task, namely because the quality of non-OEM products or generally known as KW1 products is not as good as the quality of OEM products.

However, significant difference in the selling prices does not necessarily indicate significant difference in the quality (test results) as demonstrated by automotive components which do not involve heat treatment in the manufacturing process. Due to the relatively same materials used, the test results do not indicate significant difference. Therefore, it can be concluded that the test results are relatively similar for both genuine and KW 1 spare parts which are made of relatively same materials and do not undergo heat treatment. The difference is merely caused by the different thickness of the materials used. However, for spare parts undergoing heat treatment process, the test results indicate that the strength of each of the materials is different, depending on the hardness level achieved following the heat treatment process. Meanwhile, for spare parts

made of different materials (different quality), the test results are quite different (for example, brake shoe).

Based on the tests conducted on the spare parts samples, B2TKS –the test laboratory- is unable to draw fundamental conclusions out of the test results since it did not evaluate the production process, ranging from material selection up to manufacturing process, which is beyond B2TKS' authority. Therefore, the results of further tests may be different depending on the samples tested. In other words, future tests on the samples tested herein may result in different results.

7. APPENDIX

Component Name	**: Chain, Large Sprocket and Small Sprocket**
Testing Standard	: JIS 1801 and JASO 103
Testing performed	: Material testing, including Tensile Test and Hardness test
Product	: AHM (Astra Honda Motor) Genuine Part

Weight of the parts:

- Chain (1 set) : 887.9 gram
- Large Sprocket : 639.8 gram
- Small Sprocket : 125.5 Gram

AHM Chain
Testing (Tensile Test on the Chain)

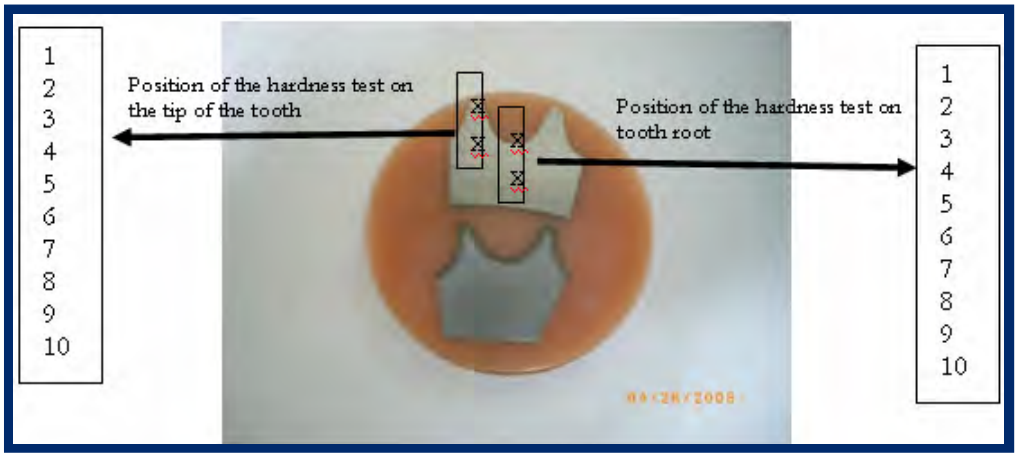
Results of the Tensile Test on the Chain

No	Test Object	Tensile Capacity	Remarks
1	Specimen 1	19.2 kN	Broken off
2	Specimen 2	19.8 kN	Broken off
3	Specimen 3	19.6 kN	Broken off

AHM Large Sprocket (40 Teeth)

Hardness Test (HV) on Back Sprocket

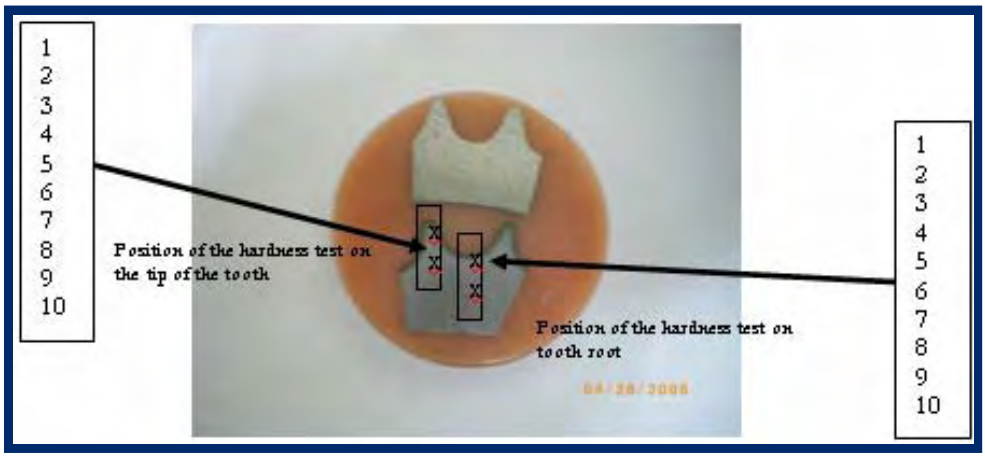
No	Testing Position	Tooth	Tooth Root
1	1	712	699
2	2	699	642
3	3	642	244
4	4	665	232
5	5	602	232
6	6	593	225
7	7	232	232
8	8	227	222
9	9	232	206
10	10	330	210



Small Sprocket

Hardness Test (HV) on Front Sprocket

No	Testing Position	Tooth	Tooth Root
1	1	840	855
2	2	855	892
3	3	855	892
4	4	873	892
5	5	855	873
6	6	840	873
7	7	840	855
8	8	840	855
9	9	825	855
10	10	825	840



Component Name **: Chain, Large Sprocket and Small Sprocket**
Testing Standard : JIS 1801 and JASO 103
Testing Performed : Material Testing, including Tensile test and Hardness test
Product : Indopart

Weight of the parts:

- Chain (1 set) : 934.9 gram
- Large Sprocket : 604.3 gram
- Small Sprocket : 128.3 Gram

Chain

Testing (Tensile Test on the Chain)

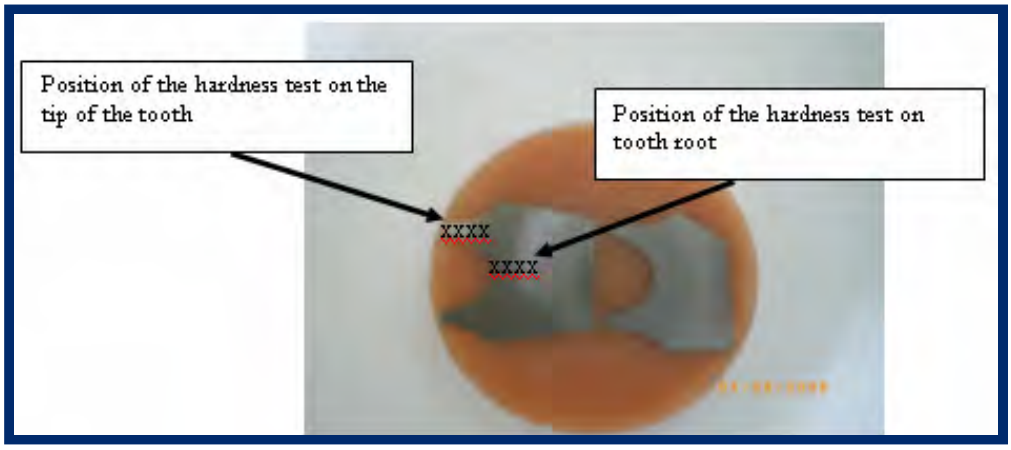
Results of the Tensile Test on the Chain

No	Test Object	Tensile Capacity	Remarks
1	Specimen 1	20.4 kN	Broken off
2	Specimen 2	20.2 kN	Broken off
3	Specimen 3	20.6 kN	Broken off

Large Sprocket (40 Tooth)

Hardness Test (HV) on Back Sprocket

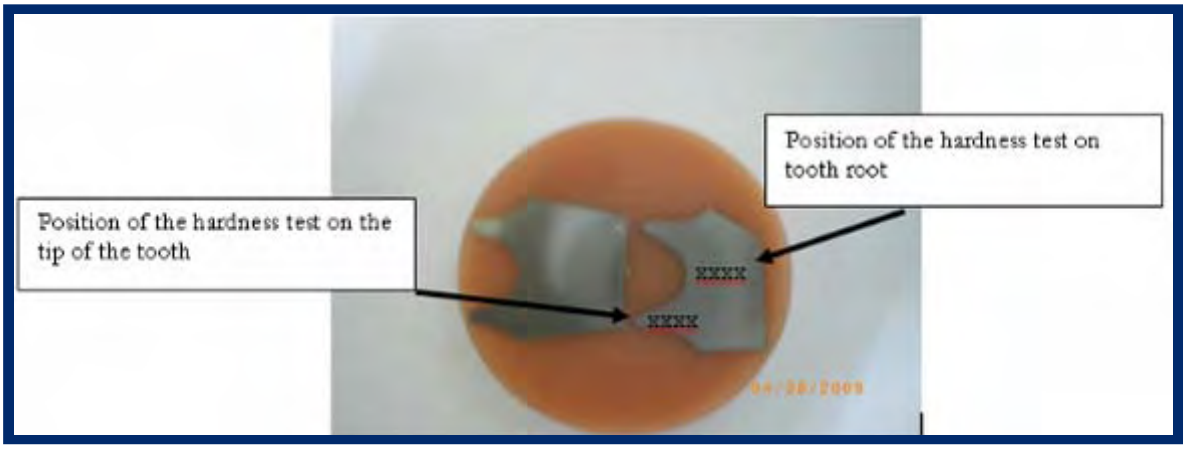
No	Testing Position	Tooth	Tooth Root
1	1	750	755
2	2	722	722
3	3	687	280
4	4	687	280
5	5	655	250
6	6	645	280
7	7	450	254
8	8	404	250
9	9	250	230
10	10	300	230



Small Sprocket

Hardness Test (HV) on Front Sprocket

No	Testing Position	Tooth	Tooth Root
1	1	855	890
2	2	855	892
3	3	840	892
4	4	890	860
5	5	850	870
6	6	850	873
7	7	814	860
8	8	820	850
9	9	820	850
10	10	820	850



Component Name : Rubber (Damper)
Testing Standard : ASTM D395, D412, 429
Testing performed : Compression, Hysterisis and Specific Weight Tests
Product : AHM (Astra Honda Motor) Genuine

Weight of the part:

- 28.0 gram/pc

Compression Test on Rubber (Damper)

7.5 mm deflection was occurred under the load of 13.75 kN and the component experienced hysteresis during load discharge and 6.2 mm deflection occurred under the remaining load of 2.5 kN. In the same condition, when pressed under the load of 2.5 kN, 3.5 mm deflection occurred.

Component Name **:Rubber (Damper)**
Testing Standard : ASTM D395, D412, 429
Testing performed : Compression, Hysterisis and Specific Weight
Product : Nissin

Weight of the part:

- 28.4 gram/pc

Compression Test on Rubber (Damper)

7.5 mm deflection was occurred under the load of 13.75 kN and the component experienced hysteresis during load discharge and 6.1 mm deflection occurred under the remaining load of 2.5 kN. In the same condition, when pressed under the load of 2.5 kN, 3 mm deflection occurred.

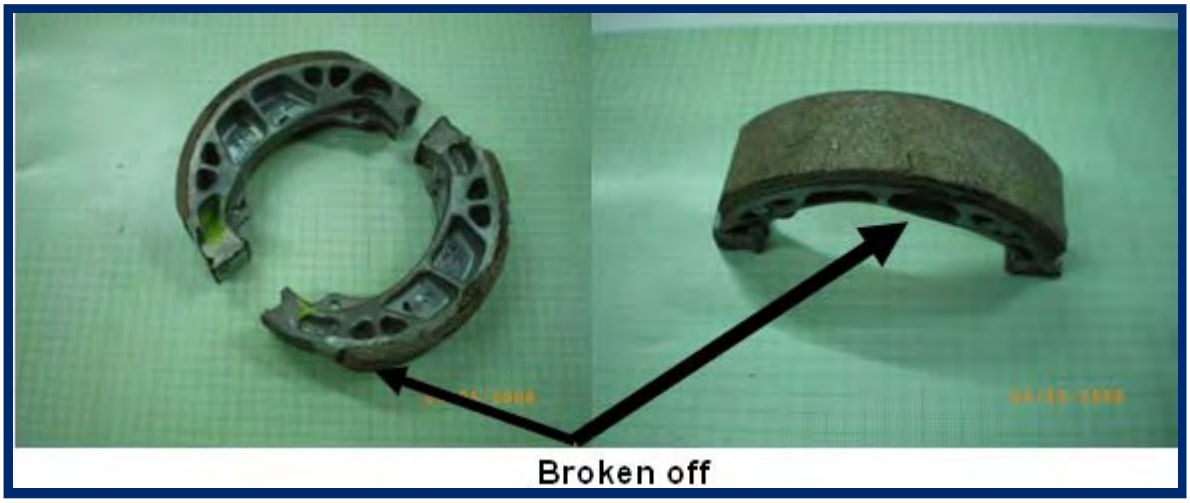
Component Name **: Back Brake Shoe**
Testing Standard : SAE J109a,840, 379 and 380
Testing performed : Specific Weight, Hardness Test, Bonding shear test and Dynamics test
Product : AHM – Genuine

Weight : 200.3 gram/set

Hardness Testing (HB)

No	Point 1	Point 2	Point 3	Average
1	50	50	40	46.6

Bonding/Shear Test



Under the maximum pressure of 11.25 kN, the bonding could withstand the pressure, but the brake shoe (brake pad) was broken off.

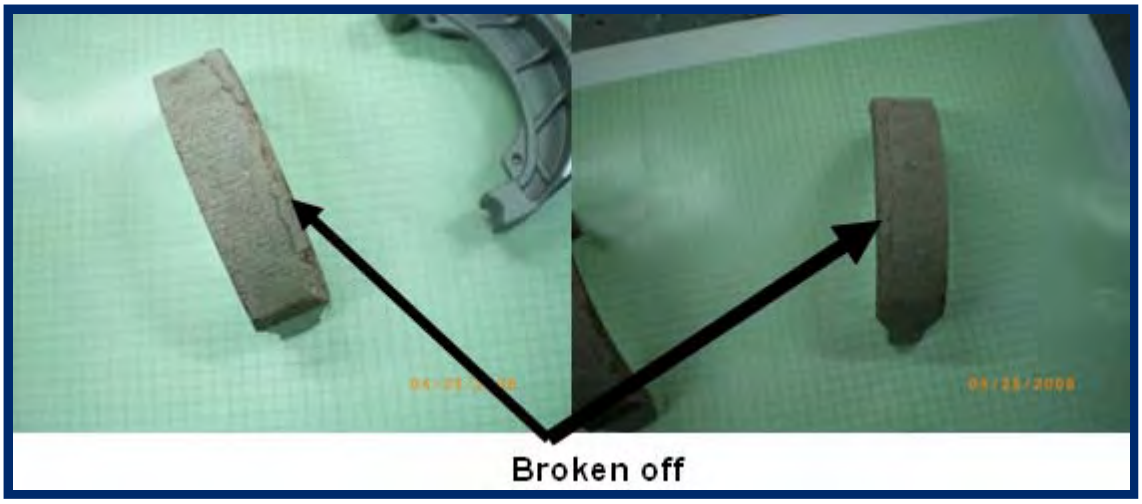
Component Name **: Back Brake Shoe**
Testing Standard : SAE J109a, 840, 379 and 380
Testing performed : Specific Weight, Hardness Test, Bonding shear test and Dynamics Test
Product : YXSZD brake shoe

Weight : 138.8 gram/set

Hardness Test (HB)

No	Point 1	Point 2	Point 3	Average
1	30	40	40	36.6

Bonding/Shear Test



Under the maximum pressure of 18.75 kN, the bonding could withstand the pressure, but the brake shoe (brake pad) was broken off.

Component Name	**: Back Brake Shoe**
Testing Standard	: SAE J109a, 840, 379 and 380
Testing performed	: Specific Weight, Hardness Test, Bonding shear test and Dynamics test
Product	: Federal Parts (brake shoe)

Weight :

164.8 gram/set

Hardness Test (HB)

No	Point 1	Point 2	Point 3	Average
1	67	57	57	60.6

Bonding/Shear Test

Under the maximum pressure of 11.1 kN, the bonding could withstand the pressure, but the brake shoe (brake pad) was broken off.

Dynamics Test on Brake Shoe
Test Equipment : Servo hydraulic PL 80 Test Equipment
Supporting tools (back brake drum, braking mechanism, plate and bearing)
Thermocouple
Test Object : Brake shoes produced by AHM, Federal and YXSZD

Dynamics Test Results

Description	Brake Load	Temperature after 3 x 1.5 hours	Thinning after 3 x 1.5 hours	Hardness (HB) after 3 x 1.5 hours (at 3 Points)
AHM Product	20 kg	97 C	0.12 mm	67, 81, 69
Federal Product	20 kg	102 C	0.15 mm	82, 84, 86
XSZD Product	20 kg	117 C	0.17 mm	70, 76, 82

Component Name **: Motorcycle Muffler**
Testing Standard : SAE J1492, ISO 5130
Testing performed : Material test, thickness, hardness and mechanical tests.
Product : AHM (Genuine)

Weight : 1.78 kg/unit
Hardness Test (HB)

No	Specimen 1	Specimen 1	Specimen 1	Average
1	204	210	206	206.3

Tensile Test (strength test)

Tensile Capacity of the Material of Genuine Motorcycle Muffler

No	Test Object	Tensile Capacity
1	1	17 kN
2	2	18.5 kN
3	3	18.75 kN

Component Name : Motorcycle Muffler
Testing Standard : SAE J1492, ISO 5130
Testing performed : Material test, thickness, hardness and mechanical tests.
Product : KW 1 no name

Weight : 1.9 kg/unit
Hardness Test (HB)

No	Specimen 1	Specimen 1	Specimen 1	Average
1	200	202	204	203

Tensile Test (strength test)

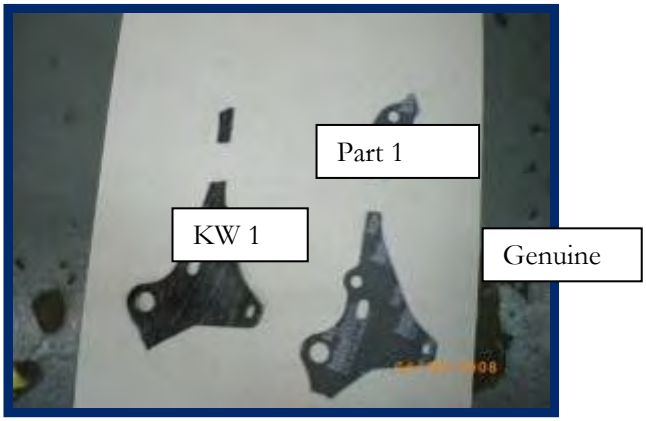
Tensile Capacity of the Material of KW1 Motorcycle Muffler

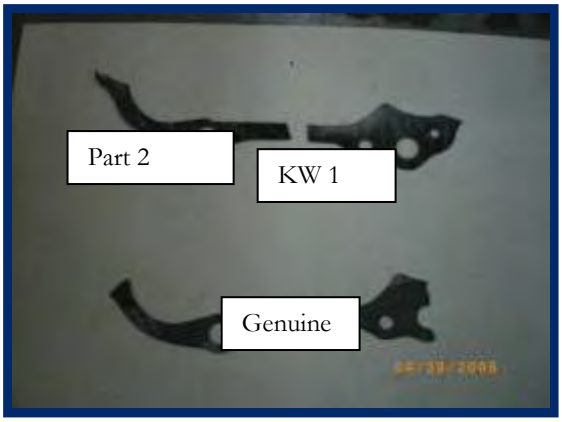
No	Test Object	Tensile Capacity
1	1	16.87 kN
2	2	16.8kN
3	3	14 kN

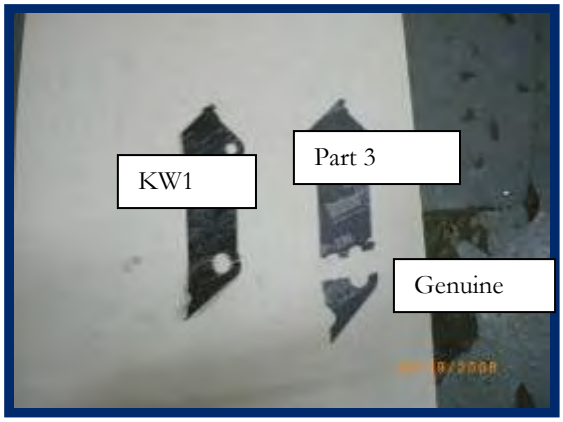
Component Name : Motorcycle Gasket
Testing Standard : SAE J90 b
Testing performed : Physical and Mechanical Test, Thickness, Conditioning test, tensile test
Product : AHM (Genuine)

Weight : 9.3 gram, thickness: 0.7 mm
Weight at the conditioned temperature of 100^0C for 1 hour = 9.0 gram

Tensile Test (strength test)







Tensile Capacity of the Material of Genuine Gasket Muffler

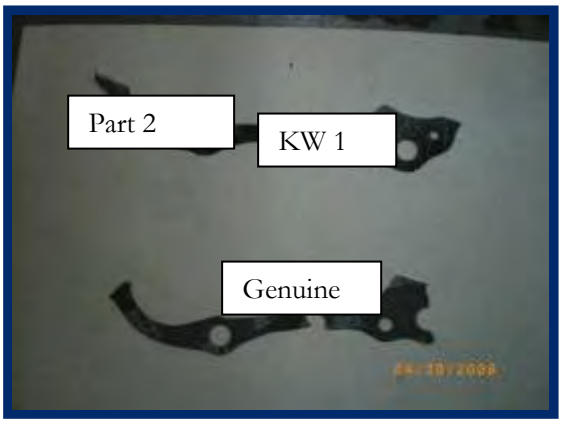
No	Test Object	Tensile Capacity
1	1	40 N
2	2	90 N
3	3	112 N

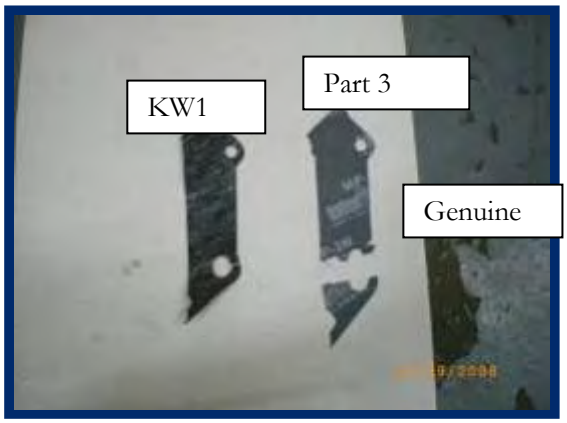
The temperature was conditioned at 100^0C $\pm$ 2^0C for 1 hour

Component Name : Motorcycle Gasket
Testing Standard : SAE J90 b
Testing performed : Physical and Mechanical Test, Thickness, Conditioning test, tensile test
Product : KW 1 – Honda

Weight : 11.1 gram, Thickness = 0.7 mm
Weight at the conditioned temperature of 100^0C for 1 hour = 9.7 gram

Tensile Test (strength test)





Tensile Capacity of the Material of Genuine Gasket Muffler

No	Test Object	Tensile Capacity
1	1	30 N
2	2	80 N
3	3	90 N

The temperature was conditioned at 100^0C $\pm$ 2^0C for 1 hour

Component Name : Car muffler
Testing Standard : SAE J1492, ISO 5130
Testing performed : Material test, thickness, hardness and mechanical tests.
Product : Toyota (Genuine)

Weight : 12.5kg/unit

Hardness Test on Muffler Plate (HB)

No	Testing point 1	Testing point 2	Testing point 3	Average
1	85.4	85	83	84.46

Hardness Test on Muffler Pipe (HB)

No	Testing point 1	Testing point 2	Testing point 3	Average
1	147	147	150	148

Photograph of Hardness Test

Tensile Test (strength test)
Tensile Capacity of the Material of Genuine Car muffler with plate thickness = 1.2 mm

No	Test Object	Tensile Capacity
1	1	15 kN
2	2	14.2 kN
3	3	15.1 kN

Component Name **: Car muffler**
Testing Standard : SAE J1492, ISO 5130
Testing performed : Material test, thickness, hardness and mechanical test.
Product : KW 1 Galvanized

Weight : 13.1kg/unit

Hardness Test on Muffler Plate (HB)

No	Testing point 1	Testing point 2	Testing point 3	Average
1	84.1	84.7	85	84.6

Hardness Test on Muffler Pipe (HB)

No	Testing point 1	Testing point 2	Testing point 3	Average
1	149	148	150	149

Tensile Test (strength test)
Tensile capacity of the Material of Genuine Car muffler with the plate thickness = 1.2 mm

No	Test Object	Tensile Capacity
1	1	15 kN
2	2	14.2 kN
3	3	15.1 kN

Component Name : Car muffler
Testing Standard : SAE J1492, ISO 5130
Testing performed : Material test, thickness, hardness and mechanical test.
Product : KW 1

Weight : 12.1kg/unit

Hardness Test on Muffler Plate (HB)

No	Testing point 1	Testing point 2	Testing point 3	Average
1	83.7	84.2	84.1	84

Hardness Test on Muffler Pipe (HB)

No	Testing point 1	Testing point 2	Testing point 3	Average
1	149	147	148	148

Tensile Test (strength test)
Tensile Capacity of the Material of Car muffler (Genuine) with the plate thickness of = 1.2 mm

No	Test Object	Tensile Capacity
1	1	12 kN
2	2	12.4 kN
3	3	12.2 kN

Component Name : **Fuel Filter**
Testing Standard : SAE J 1124
Testing performed : Dimension, Material, Pressure, Filter element tests

Product: Genuine 43.4 gram

Product KW 1 (47 gram)

No	Description	Toyota Product	KW 1 Product
1	Material	Plastic	Plastic
2	Wall Thickness	1.2 mm	1.2 mm
3	Filter Material	Paper	Paper
4	Weight	43.3 gram	47 gram
5	Pressure test/pressure drop	70 % at 1 atm	70 % at 1 atm

Component Name : **Oil Filter**
Testing Standard : JASO E 302
Testing performed : Dimension, Material, Pressure, Filter element tests

Product: Genuine

Product : KW 1 (Thailand)

No	Description	Toyota Product	KW 1 Product (Thailand)
1	Material	Plate	Plate
2	Wall Thickness	0.5	0.5 mm
3	Filter Material	Paper	Paper
4	Weight	273.1 gram	264 gram
5	Pressure test/pressure drop	66 % at 1 atm	65 % at 1 atm

Component Name **: Air Filter**
Testing Standard : SAE J 1599
Testing performed : Dimension, Material, Pressure, Filter element tests

Product: KW 1 (Thailand)

Product : Genuine

No	Description	Toyota Product	KW 1 Product
1	Material	Paper and Plate	Paper and Plate
2	Wall Thickness	0.5 mm	0.5 mm
3	Filter Material	Paper	Paper
4	Weight	325.4 gram	326 gram

SENADA – Indonesia Competitiveness Program
BRI II Tower, 8th Fl, Suite 805
Jl. Jendral Sudirman No. 44 – 46
Jakarta 10210
www.senada.or.id