

Asymmetric Swaybar Adjustment Using Adjustable Bars

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Posted on above July 2002.

G'day everyone,

I think the easiest way to start the ball rolling is to present the data we collected and let people do there some there own interpretation to begin with. But first some background information;

The comparator we use is a steel fabricated elevated bench that allows us to mount the bar in 95D poly D bushes using universal mounting saddles. We fix the left hand end of the bar solidly to the table (referred to as "fixed" end). The right hand arm is fixed to a hydraulic ram (referred to as "pump" end). Arm end link connections are steel to steel.

The ram is used to deflect the right hand bar arm over a given distance and we can read the force and deflection at any given point. Deflection is measured in mm and force is measured in arbitrary units. Allowable tolerance is +/- 20 units of force at any given point due to possible variations in test setup. However, each series of tests (within same bar shape) is performed with same setup.

We don't mean to be childish about this but we can't really publish pictures of this, as there are some issues of commercial confidence that we have to keep in mind. I realise this is not very scientific but we are a commercial enterprise and there are some limitations we have to work with and I hope you can accept and understand this.

Each test is done 3 times per hole combination to identify an average and/or rule out any extraordinary variation. The data is presented in tables with hole positions named according to test and circumstances. In this case, using a 3 hole adjustable configuration, the hole settings are "soft" for the hole closest to the end of the arm and "hard" for the furthest.

First table is a bit of an "entrée" and shows results from a stock MY00 and MY01 front bar compared with BSR20XZ 22mm adjustable rear to suit MY00. Next we move on to the "main meal" which compares various asymmetric setting combinations using a custom test bar. (Labelled "Test 1").

Desert is the same test settings of a bar (labelled "Test 2") with the same basic configuration but featuring a large hump or kink in one arm. That is, a heap more material length but with same effective arm length. We did this because of the basic asymmetric shape of the stock rear WRX bar.

Now, just when you thought we were shying a way from taking a position.... we conclude that;

- A 3 hole adjustable actually has 9 (not 5) possible positions as it relates to effect on vehicle.

- The variations between (split) symmetric combinations are small but

measurable.

- Asymmetric settings result in asymmetric response from side to side.
- Stock rear bars have asymmetric response from side to side.
- How significant in real world terms is this lack of symmetry? Who knows?

We realise this is just the beginning but we need to start somewhere and there is a limit to how much more we can do on this. We also realise that there are some weaknesses in the method but we are happy with the results and the principles they seem to support.

Whiteline Swaybar Comparator Test Data Sheet
Vehicle : Subaru WRX rear - various
Test date : 6-Aug-02



PART #	SIZE (Dia. Mm)	ADJUSTMENT @		DEFLECTION AT PUMP END (mm)					
		Fixed	Pump	30	40	50	60	70	80
				950	1200	1500	1700	2300	
				950	1150	1450	1700	2250	
				950	1200	1500	1700	2200	
MY00 OE	20	N/A	N/A	950	1183	1483	1700	2250	0
Ave units force per mm				32	30	30	28	32	0
				950	1200	1400	1650	2100	
				1000	1150	1400	1650	2200	
				1000	1200	1500	1700	2150	
MY01 OE	20	N/A	N/A	983	1183	1433	1667	2150	0
Ave units force per mm				33	30	29	28	31	0
				1050	1450	1850	2350	2800	3500
				1150	1500	1900	2350	2850	3600
				1150	1500	1950	2350	2850	3600
BSR20XZ	22	SOFT	SOFT	1117	1483	1900	2350	2833	3567
Ave units force per mm				37	37	38	39	40	45
				1400	1900	2500	3000	3700	4600
				1350	1900	2450	3000	3700	4600
				1350	1900	2500	3050	3700	4600
BSR20XZ	22	SOFT	MED	1367	1900	2483	3017	3700	4600
Ave units force per mm				46	48	50	50	53	58
				1400	1950	2500	3100	3800	4750
				1400	2000	2500	3150	3850	4800
				1450	1950	2500	3150	3800	4700
BSR20XZ	22	MED	MED	1417	1967	2500	3133	3817	4750
Ave units force per mm				47	49	50	52	55	59
				1700	2300	2900	3700	4700	
				1650	2350	2900	3650	4650	
				1650	2250	2950	3650	4600	
BSR20XZ	22	MED	HARD	1667	2300	2917	3667	4650	0
Ave units force per mm				56	58	58	61	66	0
				1900	2550	3150	3950	4900	
				1850	2500	3200	3900	4900	
				1900	2500	3200	3950	4950	
BSR20XZ	22	HARD	HARD	1883	2517	3183	3933	4917	0
Ave units force per mm				63	63	64	66	70	0

Test 1 bar is a simple U shaped blade adjustable swaybar 1000 mm wide (centre of radius to centre of radius) and 24 mm diameter.

Its 3 hole adjustable with 20 mm steps between holes. Arm are 400 mm long from centre of radius to softest hole setting.

We'll post some photo's as soon as camera is working. :-)

Whiteline has attached this image:

Whiteline Swaybar Comparator Test Data Sheet

Vehicle : Test 1 (Special bar 24mm 1000 x 400 x 3 hole)
 Test date : 7-Aug-02



* 20mm hole spacing Blade

PART #	SIZE (DIA. Mm)	ADJUSTMENT @		DEFLECTION AT PUMP END (mm)					
		Fixed	Pump	30	40	50	60	70	80
Test 1						1100	1150	1450	1700
						1100	1250	1350	1800
						1100	1200	1400	1800
		Soft	Soft	0	0	1100	1200	1400	1767
Ave units force per mm				0	0	22	20	20	22
						1150	1300	1500	1850
						1175	1325	1525	1800
						1175	1350	1500	1850
		Soft	Med	0	0	1167	1325	1508	1833
Ave units force per mm				0	0	23	22	22	23
						1050	1150	1350	1725
						1050	1125	1325	1725
						1025	1100	1375	1750
		Med	Soft	0	0	1042	1125	1350	1733
Ave units force per mm				0	0	21	19	19	22
						1200	1325	1525	1950
						1175	1325	1525	1975
						1200	1375	1525	1950
		Med	Med	0	0	1192	1342	1525	1958
Ave units force per mm				0	0	24	22	22	24
						1175	1300	1500	2050
						1150	1325	1525	2000
						1175	1350	1500	2000
		Med	Hard	0	1167	1325	1508	1700	2017
Ave units force per mm				0	29	27	25	24	25
						1050	1200	1375	1900
						1025	1225	1375	1925
						1075	1225	1375	1900
		Hard	Med	0	1050	1217	1375	1550	1908
Ave units force per mm				0	26	24	23	22	24
						1125	1350	1525	2075
						1125	1300	1500	2075
						1175	1325	1500	2050
		Hard	Hard	0	1142	1325	1508	1700	2067
Ave units force per mm				0	29	27	25	24	26

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Test 2 bar is a simple U shaped blade adjustable swaybar 1000 mm wide (centre of radius to centre of radius) and 24 mm diameter however arms are of different material length.

Its 3 hole adjustable with 20 mm steps between holes. Both arms are 400 mm long from centre of radius to softest hole setting however 1 arm has material centre line length of 580 mm via a significant kink.

Whiteline Swaybar Comparator Test Data Sheet

Vehicle : Test 2 (Special bar 24mm 1000 x 400 x 3 hole)
 Test date : 7-Aug-02



* 20mm hole spacing Blade with extra arm material on one side

PART #	SIZE (DIA. Mm)	ADJUSTMENT @		DEFLECTION AT PUMP END (mm)					
		Fixed	Pump	30	40	50	60	70	80
Test 2		Straight	Kink		1050	1200	1350	1450	1650
					1025	1200	1325	1450	1700
					1050	1200	1375	1500	1750
		Soft	Soft	0	1042	1200	1350	1467	1700
Ave units force per mm				0	26	24	23	21	21
		Kink	Straight		1100	1275	1400	1500	1750
					1100	1275	1400	1525	1725
					1125	1275	1350	1500	1775
		Soft	Soft	0	1108	1275	1383	1508	1750
Ave units force per mm				0	28	26	23	22	22
		Straight	Kink		1175	1300	1450	1625	1925
					1150	1300	1450	1600	1950
					1175	1300	1475	1600	1900
		Med	Med	0	1167	1300	1458	1608	1925
Ave units force per mm				0	29	26	24	23	24
		Kink	Straight		1175	1300	1450	1625	1950
					1175	1350	1425	1650	1925
					1175	1350	1475	1625	1925
		Med	Med	0	1175	1333	1450	1633	1933
Ave units force per mm				0	29	27	24	23	24
		Straight	Kink		1250	1425	1600	1725	2075
					1200	1450	1550	1725	2075
					1250	1450	1575	1725	2100
		Hard	Hard	0	1233	1442	1575	1725	2083
Ave units force per mm				0	31	29	26	25	26
		Kink	Straight		1250	1475	1650	1750	2150
					1300	1475	1650	1800	2125
					1300	1450	1600	1775	2125
		Hard	Hard	0	1283	1467	1633	1775	2133
Ave units force per mm				0	32	29	27	25	27

Look forward to the comments

Cheers

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 Whiteline