

Physical properties comparison test

Orthodontic elastomeric chain made of
Thermo-setting Polyurethane



Conducted at Iwamizawa factory,
Polymer Engineering Laboratories Co., Ltd.

Dates: January 21st ~ 22nd, 2016

Background:

- Today there are more competing products, being claimed as the 'Thermosetting' chain in the markets.
- Some competitors are promoting their chain by saying that it is the same product as the Energy chain.

Purpose:

Compare overall physical properties and apparent conditions of various orthodontic chains.

Procedure:

The test has been conducted principally based on JIS T6531:2012 which is according to ISO21606:2007.

- Initial Force
- Residual force after 24 hours of immersion in 37°C water.
- Ultimate force at rupture
- Thickness uniformity
- Punching accuracy

Products compared

Company/ Name of chain	RMO/ Energy Chain	G&H / Power Linx	AO/ Memory Chain	Ormco/ Power Chain	Tomy Int'l / Super Chain	Dentsply SANKIN/ Pro. Chain
Lot #	35134	NB0027-53	D66133	15K62	F465	151129
						

▪ Procedure of testing (based on JIS T6531:2012 Acc. to ISO21606:2007)

1. Select ten specimens at random and test each specimen. The test lengths are 5 elastomeric rings.
2. Place the specimen over the rods of the testing apparatus. Test rod shape is round with inner diameter more than 0.5mm and less than 1.0mm.
3. Apply the initial extensions to the sample at a rate of 100mm/min to 4 X the test length and hold 5 seconds.
4. After 5 seconds, relax extension at 100mm/min to an extension of 3 X the test length. Determine the force exerted in Newton at 30 seconds after reaching the latter extension. (**Initial force**)
5. Remove the specimen from the testing apparatus, the chain is immediately moved to the pins on the Urethane platform. Pins are previously located at 3 times distance of the test length.
6. Store in water at 37°C ($\pm 2^\circ\text{C}$) for 24 hours.
7. After 24 hours, place in water at 23°C ($\pm 2^\circ\text{C}$) for 30 minutes.
8. Take the Urethane platform out of the water, then transfer specimens on to the test rod and determine the force. (**Residual force**)
9. Perform on ten specimens and take the average value.



Immersion date and time

January 21st ~ 22nd, 2016

Temperature: 23°C / Humidity: 18%



① $37 \pm 2^{\circ}\text{C}$ (24 ± 2 hours) :
January 21st PM1:30 ~ January 22nd PM1:30

② $23 \pm 2^{\circ}\text{C}$ (30 ± 2 minutes) :
January 22nd PM1:30 ~ January 22nd PM2:00



24 hour residual force (N)																		
Co. / Name	RMO / Energy Chain			G&H / Power Linx			AO / Memory Chain			Ormco / Power Chain			Tomy / Super Chain			SANKIN / Pro. Chain		
Lot #	35134			NB0027-53			D66133			15K62			F465			151129		
	Initial	Residual	Loss(%)	Initial	Residual	Loss(%)	Initial	Residual	Loss(%)	Initial	Residual	Loss(%)	Initial	Residual	Loss(%)	Initial	Residual	Loss(%)
AVERAGE	2.19	2.00	8.68%	1.79	1.54	13.97%	1.83	1.60	12.57%	2.09	1.89	9.57%	1.83	1.56	14.75%	2.15	1.91	11.16%
1	2.16	1.86		1.68	1.66		1.89	1.64		2.15	1.93		1.88	1.79		2.19	1.94	
2	2.23	1.78		1.74	1.42		1.83	1.49		2.03	1.86		1.83	1.69		2.18	1.73	
3	2.11	1.90		1.82	1.75		1.87	1.56		2.08	1.88		1.74	1.60		2.22	1.95	
4	2.25	1.87		1.77	1.53		1.82	1.66		2.12	1.99		1.86	1.50		2.07	1.80	
5	2.17	2.10		1.80	1.56		1.86	1.56		2.10	1.89		1.80	1.56		2.20	2.02	
6	2.10	2.06		1.84	1.57		1.85	1.56		2.15	1.89		1.80	1.70		2.15	1.88	
7	2.25	2.13		1.92	1.52		1.80	1.65		1.88	1.76		1.91	1.35		2.10	1.97	
8	2.18	1.99		1.78	1.37		1.76	1.57		2.02	1.84		1.81	1.43		2.23	1.90	
9	2.20	2.12		1.76	1.62		1.79	1.65		2.20	1.90		1.70	1.45		2.11	1.92	
10	2.25	2.15		1.82	1.37		1.81	1.63		2.15	1.95		1.97	1.52		2.07	2.00	

Results: Initial Force / Residual Force / Force Loss (%)



RMO / Energy Chain

2.19

2.00

8.68%



G&H / Power Linx

1.79

1.54

13.97%



AO / Memory Chain

1.83

1.60

12.57%



Ormco / Power Chain

2.09

1.89

9.57%



Tomy / Super Chain

1.83

1.56

14.75%



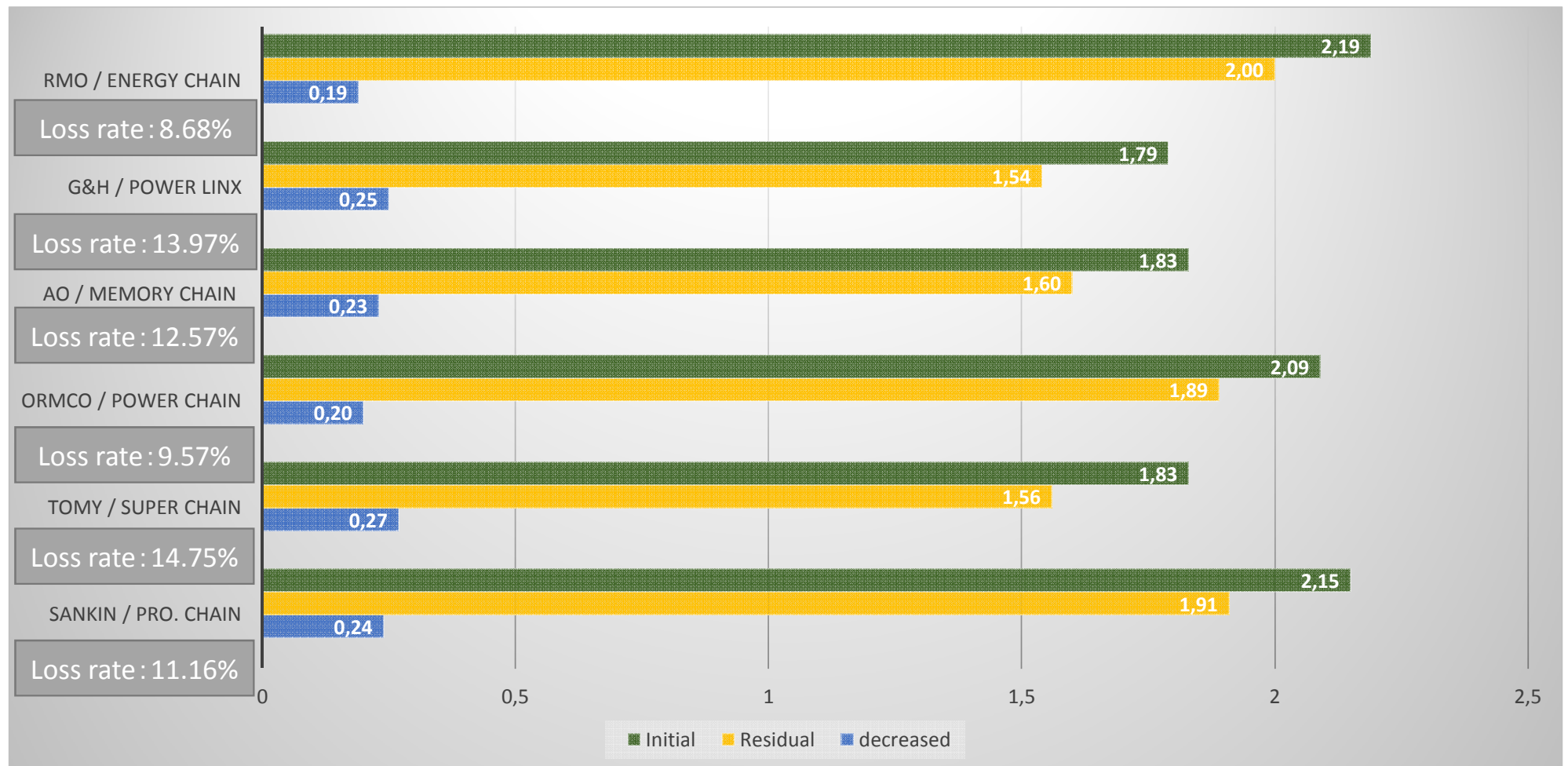
SANKIN / Pro. Chain

2.15

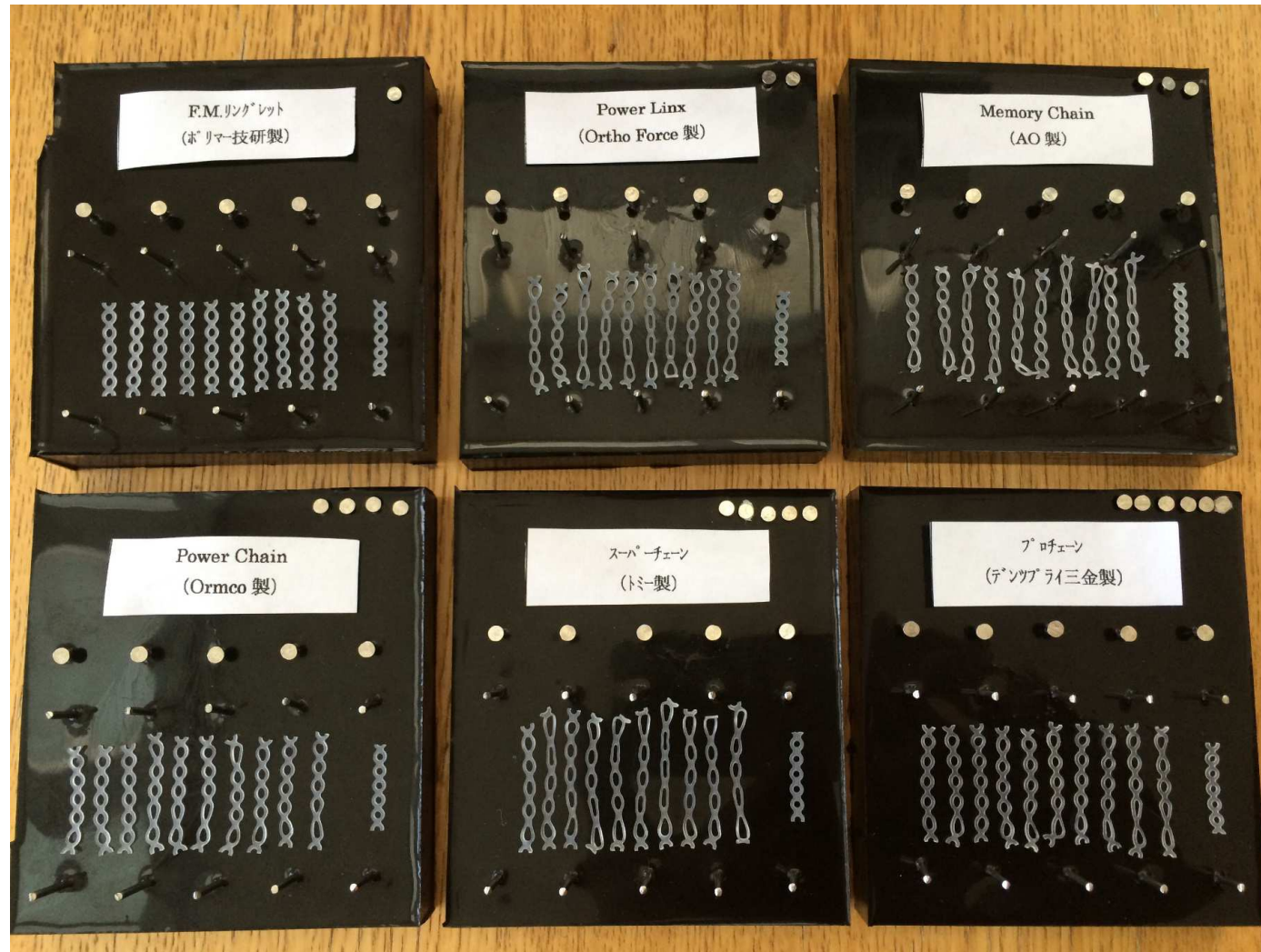
1.91

11.16%

Comparison of initial, residual and reduced force of average (N)



Comparison of deformation after 24 hours immersion test





Overall elongation can be observed but the deformation of the rings are not so noticeable and mostly keeping the original shape.