THE UTILITY OF PHENOL-ALDEHYDE CROSS LINKING RESINS IN POLYMER MODIFIED ASPHALT - THE BUTAPHALT(tm) PROCESS

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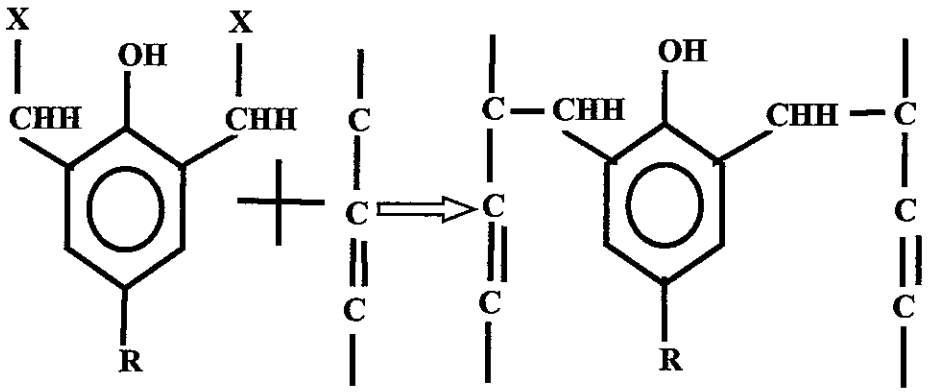
01) ATC and Tex-Par Energy, inc. Jointly Develope and Market the Butaphalt Process.

Figure 1 - Phenol-Aldehyde Cross Linking Mechanism



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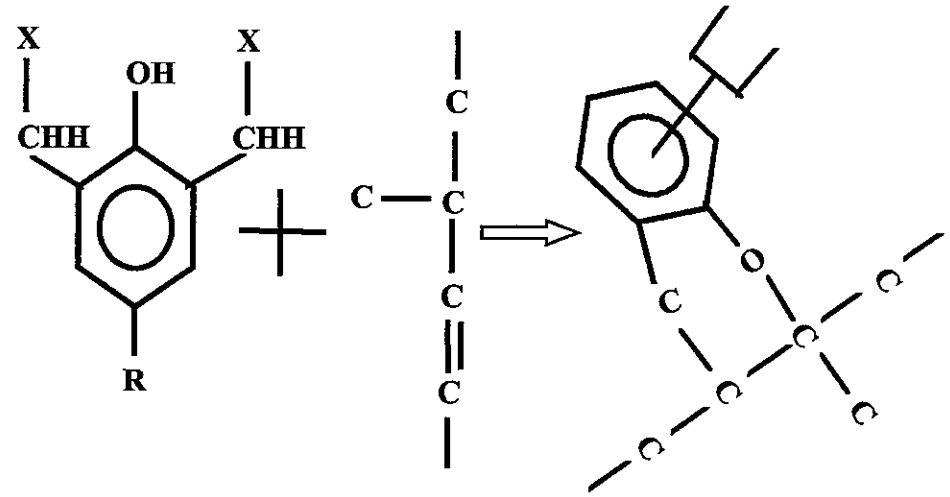
01) Phenol-Aldehyde Cross Linking or Vulacnizing Resins are common in Rubber & Plastics Industry.

02) Mechanism of Reaction from Science and Technoloy of Rubber, Second Edition, edited by James E. Mark, et. al., Academic Press, page 336.

03) Discussions in this text indicates this the most likely mechanism of X-link

04) This is the "Classical Mechanism" or Thought to be the Most "Prevelent Mechanism of Reaction".

Figure 2 - Phenol-Aldehyde Cross Link; Chroman(e) Structure



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01) This is the "Other Possible Mechanism of Reaction"

02) This is the " CHROMAN" or "CHROMANE" Mechanism

03) Mechanism of Reaction from Science and Technoloy of Rubber, Second Edition, edited by James E. Mark, et. al., Academic Press, page 338 - DISCUSSION ONLY

04) Actual Drawing Likely From Resins Technology(?) or Similar

Table 1 - Butaphalt Separation & Softening Point

Test Results in Celsius	3.50% SBS Cnvntal	3.50% SBS Butaphalt	2.50% SBS Cnvntal	2.50% SBS Butaphalt
Separation @ 162	16.11	-0.14	15.14	-0.14
Soft Pt B/4 TFOT	70.00	79.44	54.31	58.33
Soft Pt Aft TFOT	50.97	63.89	46.17	56.67
B/4 - Aft Soft Pt	-19.03	-15.55	-5.14	-1.66

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01) Lloydminster doesn't separate with Butaphalt(tm) at 2.5 or 3.5 % SBS

02) SBS = Finaprene F-411 & Butaphalt B-720 = 0.10% at Both 2.5% and 3.5% by wt. of 100%.
NOTE: Don't tell #2 ; just say high MW SBS and same use level for B-720.

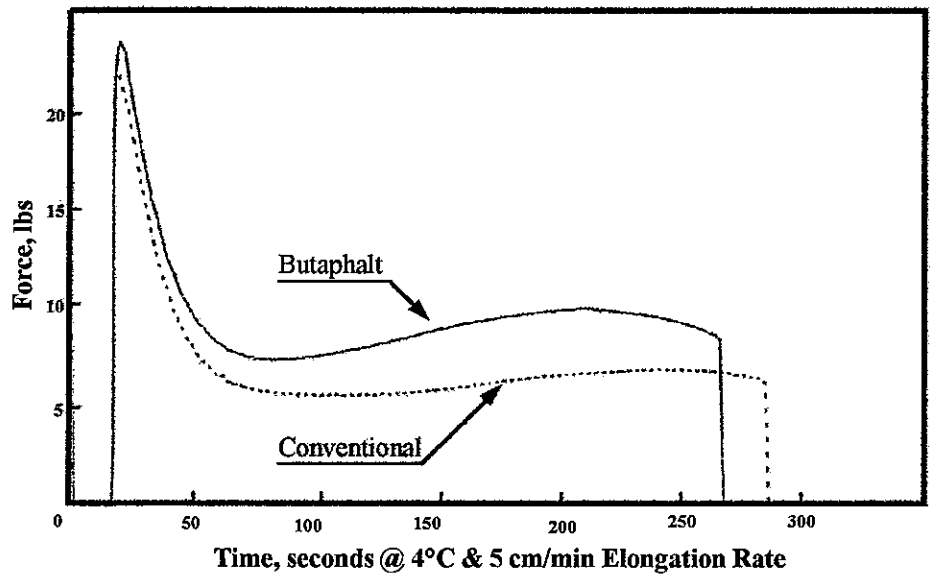
03) Softening Point higher for Butaphalt(tm) at 2.5 & 3.5 % SBS

04) Softening Point higher for Butaphalt both B/4 & Aft TFOT

05) Softenin Poinnt Dropped Most in Cnvntal - Lesat in Butaphalt(tm)

06) MOST IMPORTANT to INDICATE POSSIBLE RXN is INCREASE IN SOFTENING POINT BY BUTAPHALT OVER CNVNTAL

Figure 3 - SBS Force Ductility



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01) Force Ductility of "PROBLEM" Asphalt = Total Ardmore.

02) Problems are : Asphalt had about 15% Alaskan North Slope & Slight Air Blowing of Certain Fractions.

03) Polymer was 2.50% (by wt. of 100%) SBS = Fina 411.

04) Butaphalt Amount = 0.15% by wt. of 100%

05) Notice the OVERALL INCREASE in Initial and Throughout the Elongation.

06) Authors Opinion Butaphalt Is BETTER - Binder is TOUGHER.

Table 2 - Softening Point in Butaphalt Process

Test (Celsius)	Cnvntal	Butaphalt
Soft Pt B/4 TFOT	51.11	80.56
Soft Pt Aft TFOT	55.00	65.00
B/4 - Aft Soft Pt	+3.89	-15.56

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01) The "Problem" Asphalt had about 15% Alaskan North Slope Cruse

02) Softening Point was HIGHER for BUTAPHALT BOTH B/4 & AFT TFOT

03) Cnvntal Process = Slight increase in Softening Point

04) Butaphalt Process = Drop in Softening Point

05) Note: Butaphalt STILL Higher AFTER TFOT

Table 3 - Kinematic Viscosity in Butaphalt Process

Kinematic Viscosity	Cnvntal	Butaphalt
B/4 TFOT, cStk	495	1500
Aft TFOT, cStk	835	1457
B/4 - Aft, cStk	+40	-43
Percent Change	+8.08	-2.87

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01) Butaphalt had HIGHER VALUES BOTH B/4 AND AFT TFOT

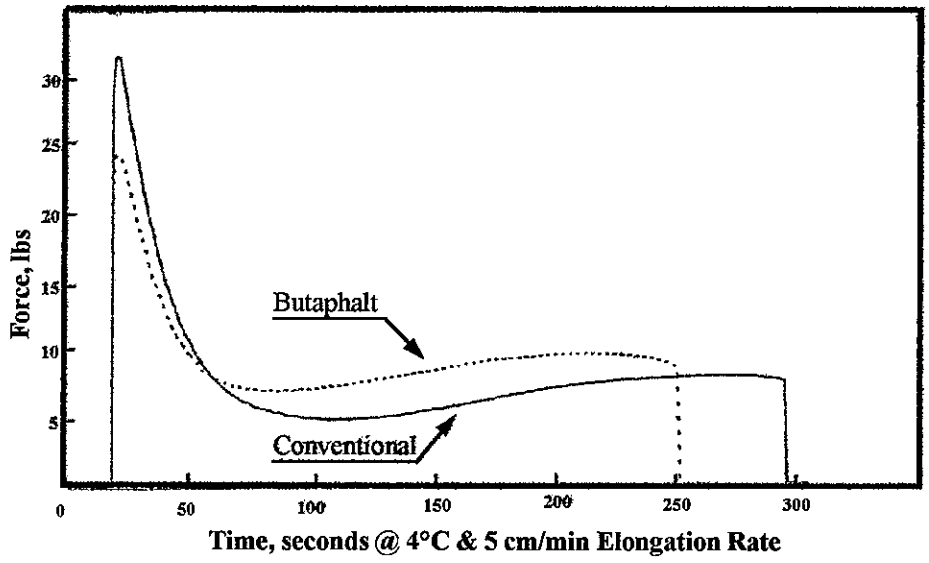
02) Butaphalt DECREASED SLIGHTLY AFT TFOT

03) Cnvntal INCREASED SIGNIFICANTLY AFT TFOT

04) Butaphalt had LOWEST % CHANGE THRU TFOT

05) THIS LOWER % CHANGE & HIGHER VALUES FOR BUTAPHALT MAKE FOR BETTER PRODUCT

Figure 4 - SBR Force Ductility



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01) Force Ductility with SBR in the "Problem" Asphalt.

02) Amount SBR = 2.50% Solids (bywt. of 100%)

03) Amount Butaphalt B-720 = 0.10% bywt of 100%

04) The "better than expected" = increase in strength at end of curve for conventional.

05) The "better than expected" likely due to PROPRIETARY Mixing PROCESS.

06) Improvments = HIGHER OVERALL STRENGTH THROUGHOUT ELONGATION by Butaphalt Process over Conventional.

07) Authours Opinion Butaphalt is BETTER - Binder is TOUGHER

NOTE: Table 4 and Table 5 are on the "Problem" Asphalt w/ SBR

Table 4 - SBR Softening Point in Butaphalt Process

Test (Celsius)	Cnvntal	Butaphalt
Soft Pt B / 4 TFOT	51.11	51.11
Soft Pt Aft TFOT	53.33	56.67
B / 4 - Aft Soft Pt	+2.22	+5.56

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01) The "Problem" Asphalt Modified by SBR & Butaphalt Process INDICATE SLIGHT INCREASE IN Softening Point THRU TFOT

02) Softening Point NOT DETRIMENTAL due to JUST SIGNIFICANT Increase in Value THRU the TFOT for Butaphalt

Table 5 - SBR Elastic Recovery in Butaphalt Process

Elastic Recovery	Cnvntal	Butaphalt
E R B / 4 TFOT	53	61
E R Aft TFOT	49	58
B / 4 - Aft E R	4	3

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01) Historically SBR has Problems with Elastic Recovery Being High Enough to Make MOST state Specifications.

02) Butaphalt Process Makes difference by INCREASING the E R ABOUT 9 % OVER Cnvntal Process

03) Butaphalt IMPROVED THE E R TO MOST STATE SPEC'S

04) Butaphalt E R HIGHER BOTH B/4 & AFT TFOT