Study on Chemical Effects in Bitumen

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Abstract: **The main purpose of this project to study is to investigate the effects of chemical material and to reduce its effects. In this project we check the chemical effects by the performing the test on it with material or without material. After checking with anti-stripping materials. The main problem comes in bitumen was stripping. The fundament behind stripping is the breaking of the adhesive bond between the aggregate and the bitumen (asphalt) in an asphaltic pavement or mixture. That means there bitumen segregate with aggregate. The development of bituminous binders with an intrinsic fuel resistance is required to limit pavement damage and maintenance operations in those areas, such as airport systems and industrial areas and filling stations, where the risk of fuel spilling exists. This project indicates that there may be as many as five different mechanisms by which stripping of asphalt from an aggregate surface may occur. These five mechanisms include detachment, displacement, spontaneous emulsification, pore pressure, and hydraulic scouring. It appears that these mechanisms may act individually or together to cause adhesion failure in bituminous mixtures. A brief description of each of the suggested mechanisms of stripping.**

***Keyword*: Bitumen, Chemicals, Anti stripping materials.**

INTRODUCTION

Bitumen is a common binder used in road construction. It is principally obtained as a residual product in petroleum refineries after higher fractions like gas, petrol, kerosene and diesel, etc., are removed. Indian Standard Institution defines Bitumen as a black or dark brown non-crystalline soil or viscous material having adhesive properties derived from petroleum crude either by natural or by refinery processes.

Literature review

Pavement consists of more than one layer of different material supported by a layer called sub grade. Generally pavement is two type flexible pavement and rigid pavement. Flexible pavements are so named because the total pavement structure deflects, or flexes, under loading.

A flexible pavement structure is typically composed of several layers of material. Each layer receives the loads from the above layer, spreads them out then passes on these loads to the next layer below. As per IJACE (International journal of advance in civil engineering) waste pvc that has been used previously as mineral water bottles, pipes, electrical fittings etc. are biologically non degradable and posed an ominous environmental problem which led to severe environmental impact. But molten PVC has a binding property which can be reused with bitumen to reduce the cost of bituminous mix. As per a research paper by Manindersingh, Praveen kumar and M.R.Mayura Bituminous binder are made use of for the carpeting of almost all the pavements in cities worldwide. Pavement with polymer and other additives exhibits greater resistance to rutting, thermal cracking, and decreased fatigue damage, stripping and temperature susceptibility.

Main Thrust of the Paper

The main focus of this paper was that to reduce the stripping of bitumen with anti-stripping materials. After the various tests perform with or without anti stripping materials. For anti-stripping their lime was selected.

RESULT

The work of the research was that first we test the sample without anti-stripping agents. There we performed 3 tests i.e. ductility test, penetration test and softening point test. After that we compile the results and prepare a graph.

Then we use the anti-stripping agent i.e. Lime. We use it with different percentages like 0%, 2%, 4%, 6%, 8% and 10%. And performed those three tests. And at last we again performed those tests with crumb rubber with same percentage.

Table No. 1 Results before adding the anti-stripping agents

TEST	Ductility test (in cm)				Penetration test (in mm)						Softening Point test (in ^{0}C) Avg.							
Percentage	**0**	**2**	**4**	**6**	**8**	**10**	**0**	**2**	**4**	**6**	**8**	**10**	**0**	**2**	**4**	**6**	**8**	**10**
Sample (Initial Result)	67				38.4 Avg.						55							
With Kerosene	67	59	56	49.5	40	35.5	38	56	69	79	102	110	55	47.5	41.5	39	36	31
With Diesel	67	59	51	42	33.5	30	38	56	81	94	126	141	55	47	39.5	37.5	35	32
With Petrol	67	61	56.5	48	47	44.5	38	47	64	80	96	115	55	48.5	41	36	34.5	33.5
With Lubricating Oil	67	65	55.5	47	43	41	38	44	49	57	69	73	55	53	50.5	46.5	42	36.5

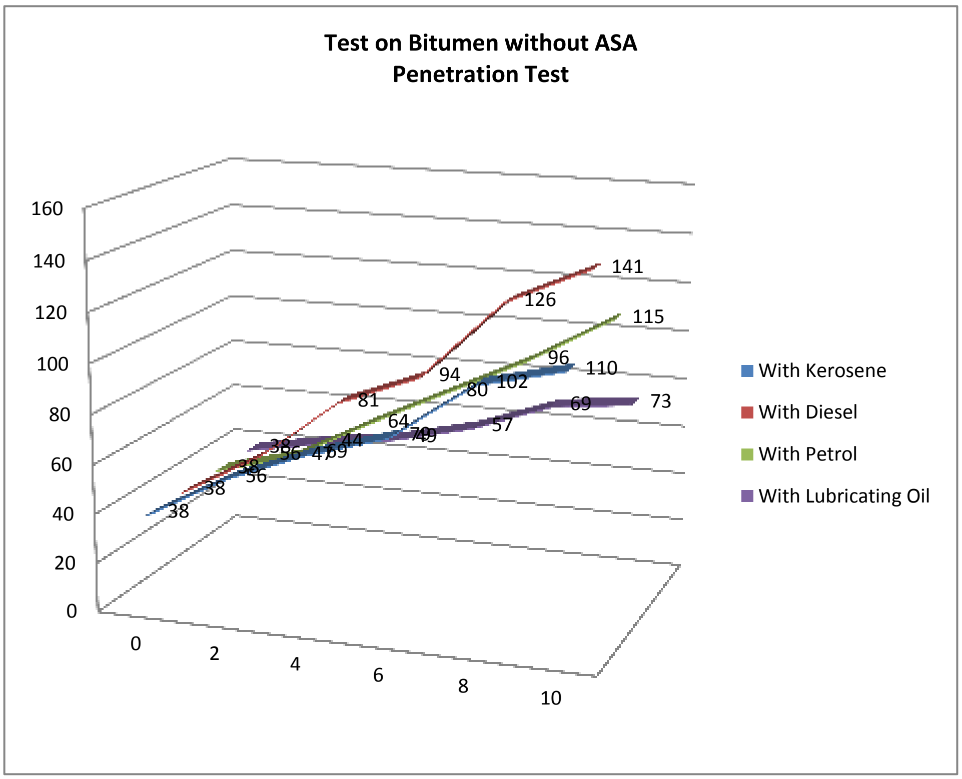

Figure No. 1 Test on Bitumen without ASA Penetration Test

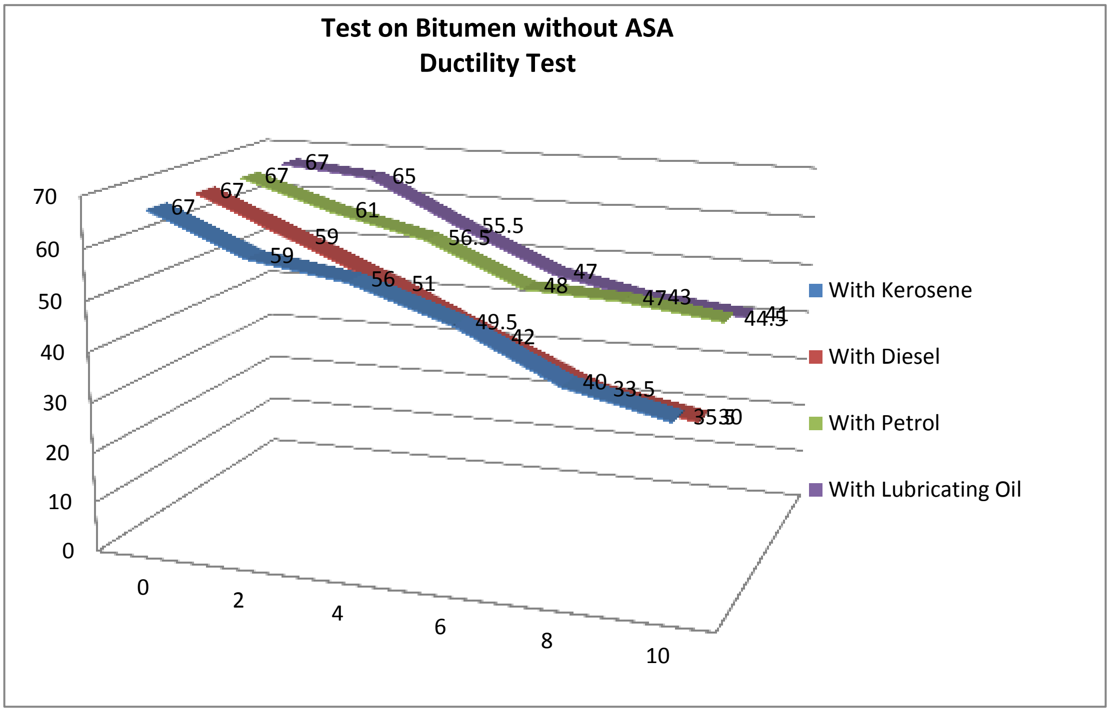

Figure No. 2 Test on Bitumen without ASA Ductility Test

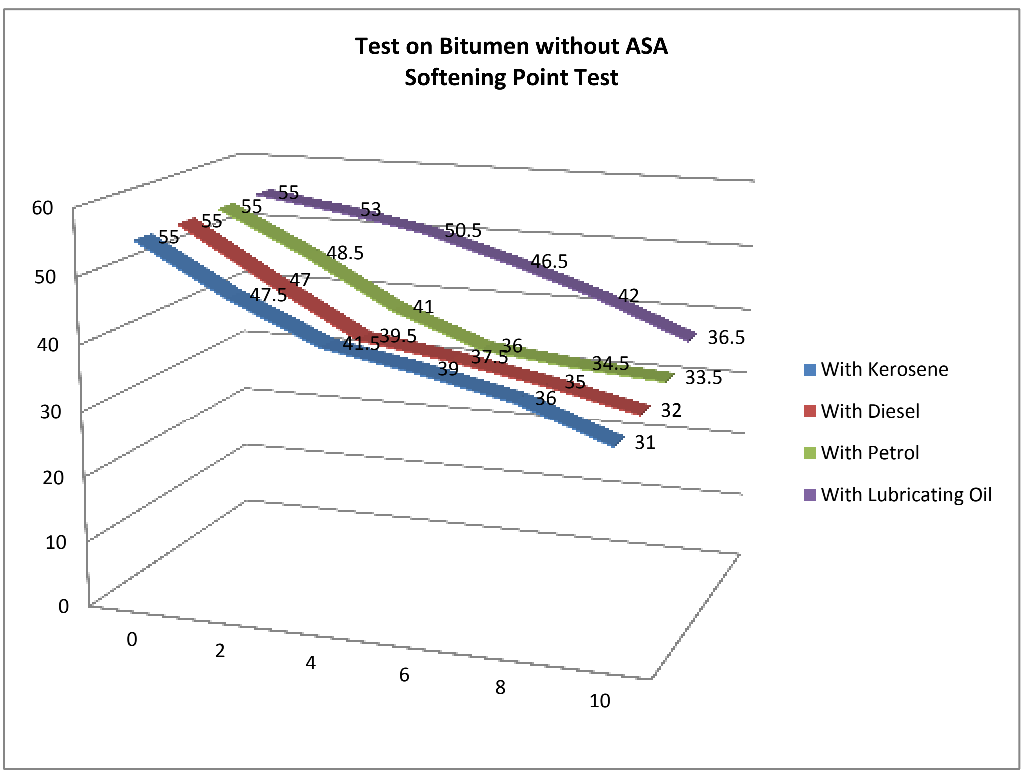

Figure No. 3 Test on Bitumen without ASA Softening Point Test

Table No. 2 Results after adding the anti-stripping agents (Lime)

TEST	Ductility test (in cm) Mean Value						Penetration test (in mm)						Softening Point test (in ^{0}C) Avg.					
Percentage	**0**	**2**	**4**	**6**	**8**	**10**	**0**	**2**	**4**	**6**	**8**	**10**	**0**	**2**	**4**	**6**	**8**	**10**
Kerosene(10%) + Lime	35.5	39	40.5	44	46	50	110	90	86	67	58	46	31	35	38	43.5	45	49.5
Diesel(10%) + Lime	30	33	35.5	39.5	43	47.5	141	128	111	92	85	66	32	35.5	40.5	42.5	49.5	54
Petrol(10%) + Lime	44.5	47	49	51	54.5	56.5	112	96	89	84	70	56	34.5	36.5	40	44	46	49.5
Lubricating Oil(10%) + Lime	41	45	47.5	49	54	58.5	72	66	57	56	48	45	33.5	36	37	39	39.5	43.5

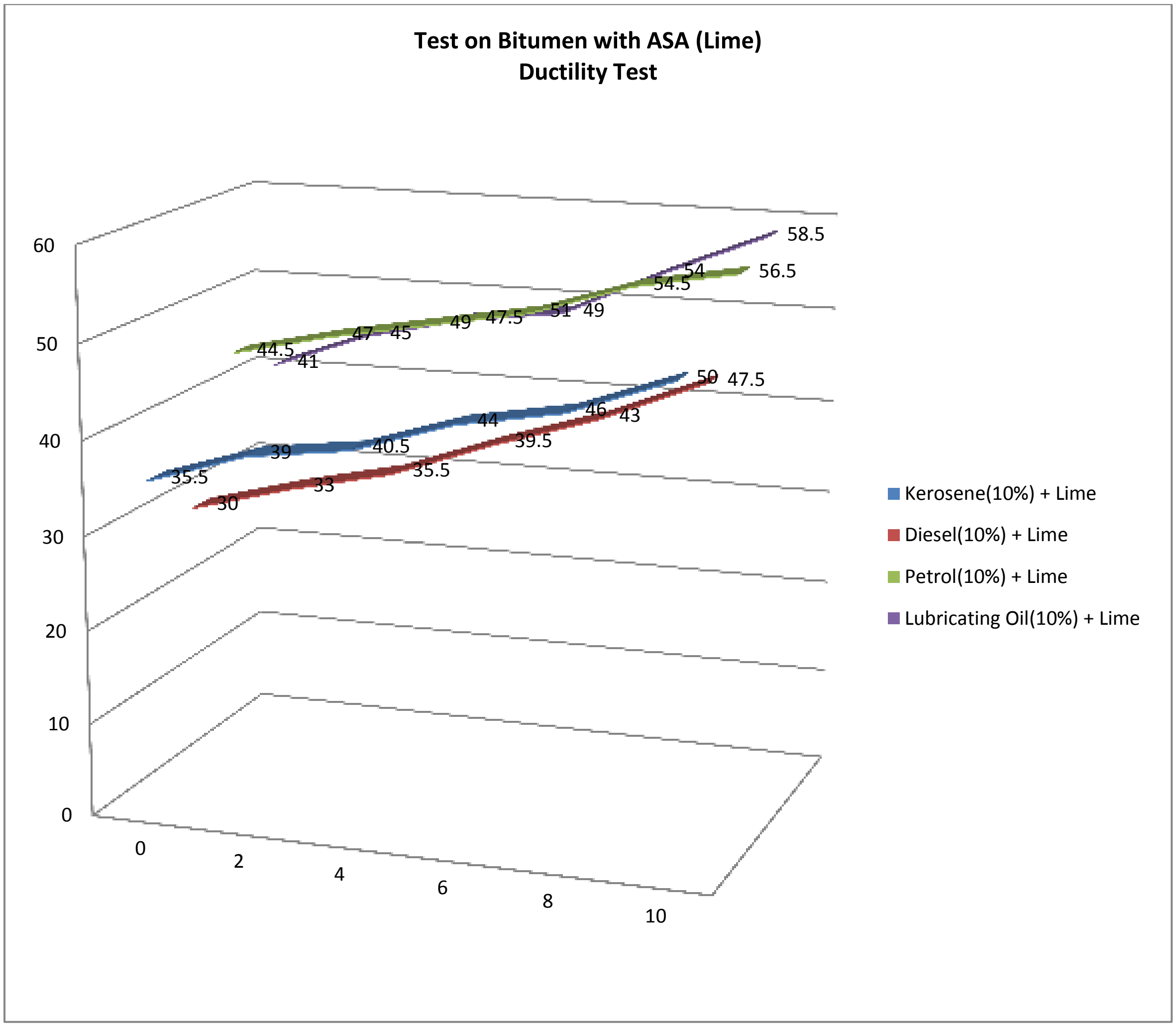

Figure No. 4 Test on Bitumen with ASA (Lime) Ductility Test

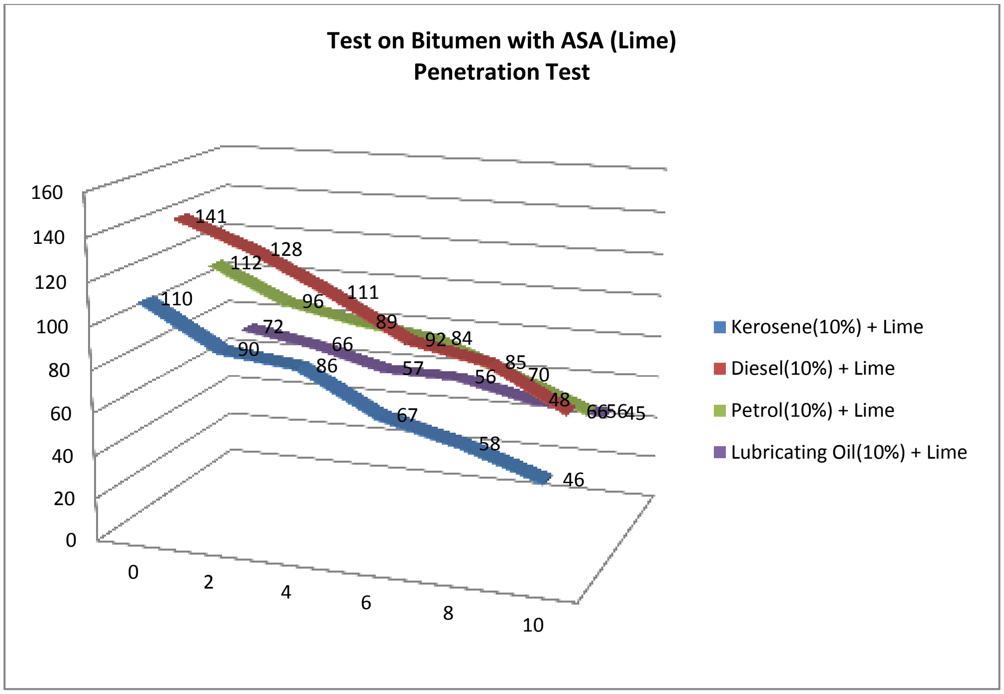

Figure No.5 Test on Bitumen with ASA (Lime) Penetration Test

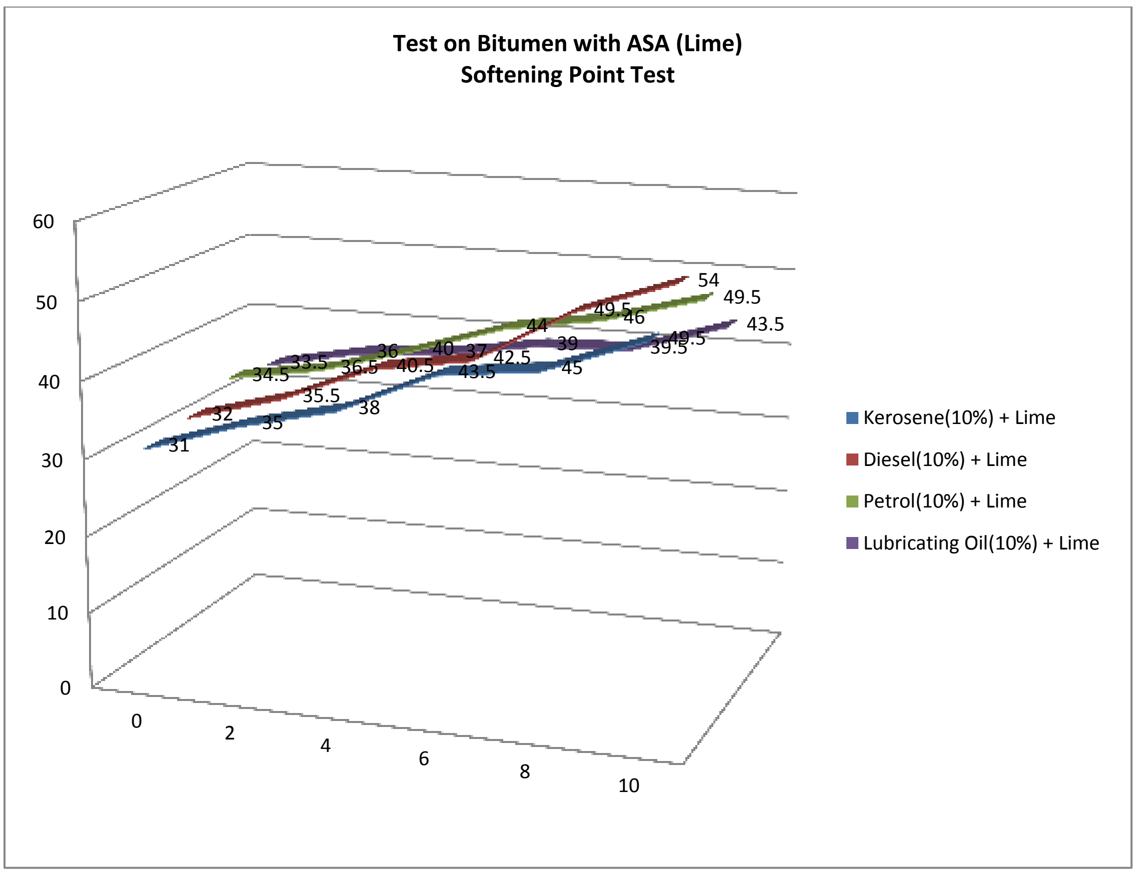

Figure No. 6 Test on Bitumen with ASA (Lime) Softening Point Test

Table No 3 . Results after adding the anti-stripping agents (Crumb Rubber)

TEST	Ductility test (in cm) Mean Value						Penetration test (in mm)						Softening Point test (in ^{0}C) Avg.					
Percentage	**0**	**2**	**4**	**6**	**8**	**10**	**0**	**2**	**4**	**6**	**8**	**10**	**0**	**2**	**4**	**6**	**8**	**10**
Kerosene(10%) + Crumb Rubber	35.5	41	44.5	48.5	51	57	110	86	80	64	51	45	34.5	38.5	42.5	52	57	57.5
Diesel(10%) + Crumb Rubber	35.5	40	45	50.5	54.5	57.5	110	86	76	57	52	40	34.5	40	44	46	49.5	53
Petrol(10%) + Crumb Rubber	35.5	42	46	47.5	50	54.5	110	84	76	57	48	31	34.5	39.5	43	47	50	53.5
Lubricating Oil(10%) + Crumb Rubber	35.5	43.5	47.5	54	54.5	59.5	110	80	72	56	47	28	34.5	40.5	44	47	50	53

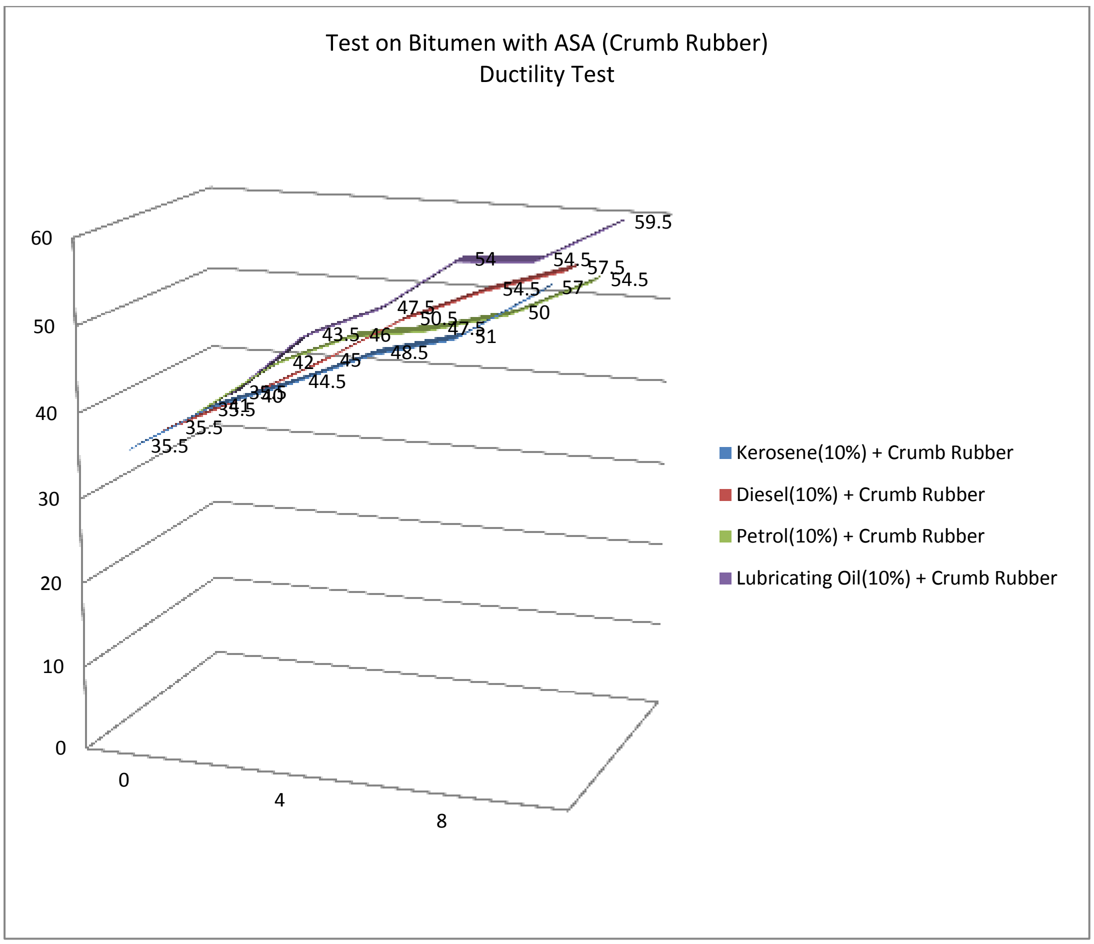

Figure No. 7 Test on Bitumen with ASA (Crumb Rubber) Ductility Test

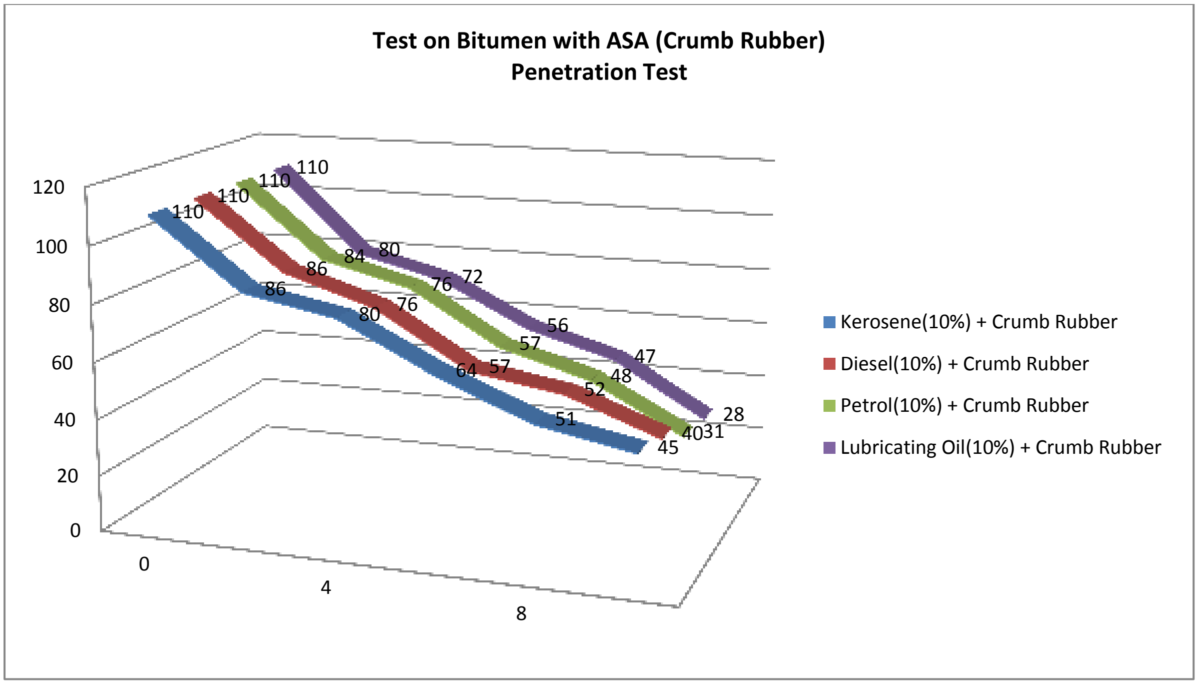

Figure No. 8 Test on Bitumen with ASA (Crumb Rubber) Penetration Test

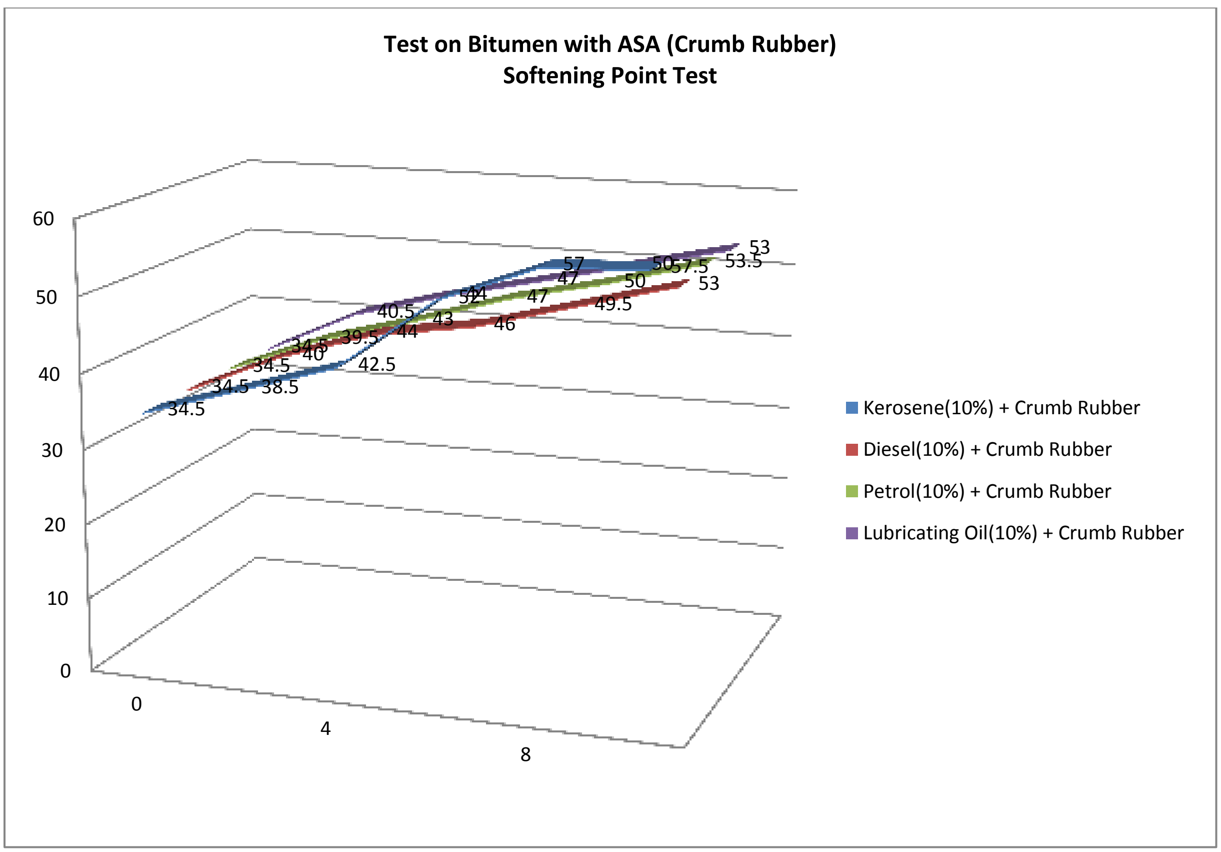

Figure No. 9 Test on Bitumen with ASA (Crumb Rubber) Softening Point Test

CONCLUSION

Although research data concerning bitumen pretreatment is scarce, this concept opens a whole new avenue for further concentrated work. A variety of pretreatment compounds along with pretreatment conditions that work in an effective and feasible manner could be investigated. The contribution of different modifiers on the fuel resistance of asphalt binders was outlined and discussed to attain the development of special bituminous materials with an improved intrinsic resistance to hydrocarbons oils. The future scope this research was that to reduce the segregation of the bitumen concrete and the increase the workability or life of the pavement of that place.

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