UTILIZATION OF PAPER INDUSTRY PROFLUENT AS WATER REDUCING AGENT IN CONCRETE

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Abstract. The present paper portrays the use of paper industry profluent as water lessening specialist in concrete for its consequences for different properties like droop, setting time, compressive quality and so forth. The properties have been contrasted and industrially accessible water diminishing operators like Modified lignosulphonate (MLS) and Sulphonated Naphthalene Formaldehyde Condensate (SNF). It has been seen from examines that the profluent which is a wellspring of contamination on getting water body's sea-going biological system and nearby rural fields, cattle's and so forth and can be utilized as an admixture in cement to show signs of improvement workability at same w/c proportion or by decreasing w/c proportion at a given workability.

Key words: lignosulphonate, concrete, water reducing agent, effluent

1. INTRODUCTION

Paper industry, little and vast, has extended hugely over the most recent five decades in India. These ventures utilize wood and rural buildups in papermaking and releases tremendous volumes of exceedingly shaded and lethal waste water (profluent) in nature. The procedure breaks up the lignin introduce in the wood and releases the cellulose fiber. Lignin is changed over into thio and soluble base lignin in Kraft process and dialect sulphonate in Sulphite process. The strands still contain a piece of lignin and consequently are shaded dark colored and require blanching for making white paper. The spent alcohol from Kraft process or Salt process is either depleted out or gathered for recuperation of chemicals, wherever concoction recuperation is possible. The paper business expends around 300 m^3 water for each ton of paper and release around 250 m^3 of water for every ton of paper. The procedure of mash washing offers ascend to dim darker hued squander known as stock wash or advantageously called as dark alcohol. On standing, the emanating after some time has smell.

The dark colored shading on long standing is conferred mostly by the nearness of lignin and its subsidiaries.

Lignin subordinates account 20% of the organization of wood. The synthetic recuperation is done from the dark alcohol which contains 90% of aggregate lignin of the wood.

2. MATERIALS AND EXPERIMENTAL WORK

2.1 CHARACTERISTICS OF COMMERCIALLY AVAILABLE ADMIXTURES

Sl.No.	PARAMETER	MLS	SNF
1.	COLOUR	DARK BROWN	DARK BROWN
2.	PHYSICAL STATE	LIQUID	LIQUID
3.	P^H	4.96	4.3

4.	TOTAL SOLIDS (mg/l)	382760	140585
5.	TOTAL SUSPENDED SOLIDS (mg/l)	100	105
6.	TOTAL DISSOLVED SOLIDS (mg/l)	382660	140480
7.	CHEMICAL OXYGEN DEMAND (mg/l)	366396	230769
8.	BIOCHEMICAL OXYGEN DEMAND (mg/l)	138200	116384
9.	CHLORIDE (mg/l)	867	578
10.	SULPHATE (mg/l)	5050	5192

2.2 CHARACTERISTCS OF PAPER MILL EFFLUENT

Sl. No.	PARAMETER	SPME (small paper mill effluent)	LPME(large paper mill effluent)
1.	COLOUR	DARK BROWN	LIGHT BROWN
2.	PHYSICAL STATE	LIQUID	LIQUID
3.	P^H	7.81	5.85
4.	TOTAL SOLIDS (mg/l)	30228	34416
5.	TOTAL SUSPENDED SOLIDS (mg/l)	215	195
6.	TOTAL DISSOLVED SOLIDS (mg/l)	30013	34221
7.	CHEMICAL OXYGEN DEMAND (mg/l)	102561	19658
8.	BIOCHEMICAL OXYGEN DEMAND (mg/l)	3015	5890
9.	CHLORIDE (mg/l)	459	545
10.	SULPHATE (mg/l)	810	980

2.3. LABORATORY DETERMINATIONS

The following experiments were carried out on the effluent, MLS, SNF:

a) The effect of effluent, MLS, SNF on the setting time of cement at various dosages has been studied as per BIS 4031-1988.

b) The workability of concrete mix was determined by the slump test BIS 1199-1988. The slump loss or loss of workability with time using effluent and commercial water reducing agent was measured at different time intervals.

c) The effect of effluent, MLS, SNF on the compressive strength of concrete at 3, 7 and 28 days was determined at different w/c ratios and at different dose level.

BIS 4031 –1988 REQUIREMENTS:

1. CONSISTENCY OF CEMENT: 29%
2. INITIAL SETTING TIME: NOT LESS THAN 30 MINUTES
3. FINAL SETTING TIME: NOT MORE THAN 600 MINUTES

3. RESULTS AND DISCUSSION

The tables 3.1-3.7 shows the effect of effluent dose and that of commercial admixtures on the setting behaviour of cement compared to control mix initial (110 mins) and final (220 mins) time, the addition of effluent dose (1.5 and 2.0) from small mill has delayed initial setting by 40 and 50 minutes, while 15 and 45 minutes delay in final setting time. In case of large paper mill effluent the delay in initial setting is 45 and 50 minutes and that of final is 35 and 50 minutes.

The addition of modified lignosulphonate (MLS) at 0.2% and 0.5% dose level, there is 65 and 80 minutes delay in initial setting time, while 70 and 90 minutes delay in the final setting time. In the case of SNF at 0.6% and 1.2% dose level, delay in initial setting time of cement (105 mins and 130 mins) and final setting (110 mins and 135 mins) has been observed.

TABLES

Table 3.1 EFFECT OF SPME, LPME, MLS AND SNF ON THE SETTING TIME OF CONCRETE

Sl. No.	DESCRIPTION	% DOSE	SETTING TIME	
			INITIAL	FINAL
1.	CONTROL	NIL	110	220
2.	SMALL PAPER MILL EFFLUENT (SPME)	1.5	150	235
		2.0	160	265
3.	LARGE PEPER MILL EFFLUENT (LPME)	1.5	155	255
		2.0	160	270
4.	MODIFIED LIGNOSULPHONATE (MLS)	0.2	175	290
		0.5	190	310
5.	SULPHONATED NAPTHALENE FORMALDEHYDE CONDENSATE (NSF)	0.6	215	330
		1.2	240	355

Table 3.2 WORKABILITY OF M30 CONCRETE IN TERMS OF SLUMP VALUE FOR VARIOUS W/C RATIO.

Sl. No	DESCRIPTION	% DOSE	SLUMP VALUE (mm)		
			W/c RATIO		
			0.5	0.45	0.4
1.	CONTROL	NIL	30	_	_
2.	SPME	1.5	70	50	30
		2.0	130	65	40
3.	LPME	1.5	100	90	70
		2.0	140	100	80
4.	MLS	0.2	-	70	30
		0.5	-	95	55
5.	SNF	0.6	-	80	45
		1.2	-	140	75

Table 3.3 LOSS OF WORKABILITY OF M30 CONCRETE AT 0.5 W/C RATIO MODIFIED WITH VARIOUS ADMIXTURES

Sl. No.	DESCRIPTION	% DOSE	SLUMP OF CONCRETE (mm)		
			TIME ELAPSED AFTER MIXING		
			5 MINS	15 MINS	30 MINS
1.	CONTROL	NIL	30	25	15
2.	SPME	1.5	70	35	20
3.	LPME	2.0	130	110	70
4.	MLS	1.5	100	80	65
5.	SNF	2.0	140	120	95

Table 3.4 LOSS OF WORKABILITY OF M30 CONCRETE AT 0.45 W/C RATIO MODIFIED WITH VARIOUS ADMIXTURE S

Sl. No.	DESCRIPTION	DOSE %	SLUMP OF CONCRETE (mm)		
			TIME ELAPSED AFTER MIXING		
			5 mins	15 mins	30 mins
1.	SPME	1.5	50	30	15
		2.0	65	40	20
2.	LPME	1.5	90	60	35
		2.0	100	65	35
3.	MLS	0.2	70	40	20
		0.5	95	70	45
4.	SNF	0.6	80	50	25
		1.2	140	90	60

Table 3.5 LOSS OF WORKABILITY OF M30 GRADE CONCRETE AT 0.4 W/C RATIO MODIFIED WITH VARIOUS ADMIXTURES

Sl. No.	DESCRIPTION	DOSE %	SLUMP OF CONCRETE (mm)		
			TIME ELAPSED AFTER MIXING		
			5 mins	15 mins	30 mins
1.	SPME	1.5	30	20	10
		2.0	40	25	15
2.	LPME	1.5	70	45	20
		2.0	80	50	25
3.	MLS	0.2	30	15	5
		0.5	55	30	15
4.	SNF	0.6	45	30	15
		1.2	75	55	25

Table 3.6 WORKABILITY OF M30 GRADE CEMENT CONCRETE AT REDUCED WATER CONTENT AT VARIOUS DOSE OF ADMIXTURES.

Sl. No	DESCRIPTION	%DOSE	W/C RATIO	SLUMP
1.	CONTROL	0	0.5	30
2.	SMALL MILL	1.5	0.4	30
3.	MLS	0.2	0.4	30
4.	SNF	0.2	0.4	45

Table 3.7 COMPRESSIVE STRENGTH OF M30 GRADE CEMENT CONCRETE AT 0.45 W/C RATIO WITH THE ADDITION OF VARIOUS ADMIXTURES

Sl. No.	DESCRIPTION	DOSE %	COMPRESSIVE STRENGTH (N/mm²)		
			3 DAY	7 DAY	28 DAY
1.	CONTROL	0	25.8	30.4	36.5
2.	SPME	1.5	26.3	31.26	38.7
		2.0	26.22	32.89	36.3
3.	LPME	1.5	24.45	30.96	36.3
		2.0	30.22	32.60	37.04
4.	MLS	0.2	24.00	15	40.3
		0.5	22.11	30	39.56
5.	SNF	0.6	24.45	30	36.25
		1.2	26.96	55	37.63

Table 3.8 COMPRESSIVE STRENGTH OF M30 GRADE CEMENT CONCRETE AT 0.4 W/C RATIO WITH THE ADDITION OF VARIOUS ADMIXTURES

Sl. No.	DESCRIPTION	DOSE %	COMPRESSIVE STRENGTH (N/mm²)		
			3 DAY	7 DAY	28 DAY
1.	CONTROL	-	31.4	35.5	41.2
2.	SPME	1.5	32.59	37.56	43.56
		2.0	33.00	39.11	44.5
3.	LPME	1.5	29.04	34.97	39.00
		2.0	33.11	40.89	42.00
4.	MLS	0.2	32.0	40.30	41.63
		0.5	29.33	34.81	39.7
5.	SNF	0.6	32.74	39.11	40.14
		1.2	29.33	35.78	39.11

4.CONCLUSION

From the above tests and the outcomes got, it is seen that the paper industry profluent containing lignosulphonate can be adequately utilized as an admixture in solid which is generally a wellspring of contamination. The expansion of gushing has no noteworthy impact on the setting conduct of concrete and is well inside BIS limits. Studies have demonstrated that the expansion of paper process profluent enhances the workability by expanding droop estimation of cement and is tantamount to business super plasticizers. Studies uncover that the 28 days compressive quality increments by over 10% with the utilization of LPME than SPME as the lignin content is more. Thus the LPME and SPME attributes as an admixture in solid contrast well and industrially accessible super plasticizers like Modified Lignosulphonate (MLS) and Sulphonated Naphthalene Formaldehyde (SNF)Condensate used for the tests

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