Development of Indigenous Top Press Roll For Paper Machine

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ABSTRACT

The design and development of Top Press Roll from indigenously available natural rock, is the result of pioneering efforts of Sri K, M. Banthia, Vice President, Sirpur Paper Mills Ltd., towards import substitution in pulp and paper industry. The article highlights many characteristics of this particular rcck which meets the operational demands of paper machine press section and reports on the performance of these rolls in field application.

INTRODUCTION

In the year 1978, The Sirpur Paper Mills has introducecl Top Press Roll manufactured out of a kind of monolithic, microporous, natural rock as an import substitution product for paper machines. Previously many Indian Mills were importing granite or stonite top press rolls at almost triple the cost of the indegenous roll, India has rich deposits of this pariicular natural rock in Central India, which consists of many minerals such as silica, iron, etc. Its colour varies from red, brown to buff depending on the nature of its composition. Its characteristics such as its high resistance against ageing, action of acid and alkaline medium. high temperaturc abrasion and corrosion are particularly suitable for paper machine operation. Main physical properties of this rock are as follows :

STRENGTH :

Rolls manufactured out of this natural rock are designed to last for many years and to withstand great stresses. The strength or compression strength of rock is its resistance to crushing under load. Generally it has compression strength of 9000 psi and modulus of elasticity of 3000,000 psi. Its specific gravity varies from 2.22 to 2.95 and depends on the age of the rock.

MICROPOROSITY

The roll surface in contact with wet web of paper or felt has excellent sheet release tendency without undue tension and picking giving optimal strength and surface properties for the finished paper. Thus there are less press breaks and ease in removing and feeding paper from press roll. Non-sticking tendency of wet web to the surface of press roll is due to the existence of micropores in this natural rock crystals having air. After the press nip this air expands releasing the paper from the roll. Porosity of this rock varies much from less than 1% to as much as 15%. Lower the porosity higher the compression strength of the rock and henee those with higher porosity are not suitable for roll manufacture.

HARDNESS

This roll surface can be ground and polished to a very high finish. It is resistant to chemical and mechanical wear, the doctor blades have a minimum effect on the hard surface and the roll retains its gloss for a long time. Regrinding and years of use do not alter the character of the surface. Generally the abrasion hardness Index of good quality rock reaches upto 26 (ASTM-C241-51).

PRODUCT DEVELOPMENT

Considerable care is exercised in the choicc of the rock for the manufacture of top press roll. Prepared cubes of the specimen are tested for compression strength porosity and hardness. Homogeneous and fissurless rock of high quality is quarried from the mines. Initially the selected rock structure is worked with chisels and cutting tools to rough size of the roll diameter and length (Fig. 1).

To fix and strengthen the stone body on the centre shaft a special grouting technique is employed. After the roll assembly is statiscally balanced, its surface is ground to a very high finish and polish within tolerance of Ra= 1.5 micron (Fig. 2a & b)

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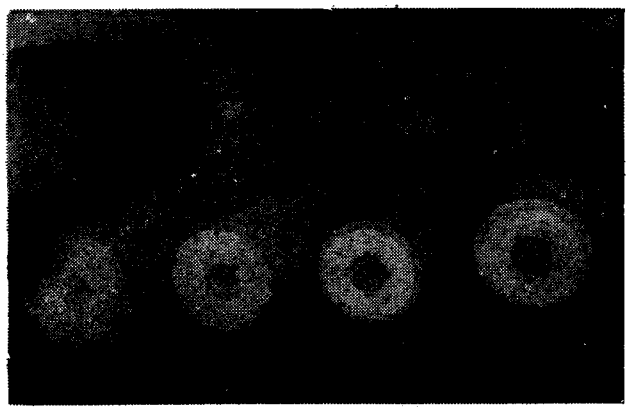


Fig. No. 1
Top Press Roll body from indigenous ratural rock
The Sirpur Paper Mills Ltd.,
SIRPUR KAGHAZNAGAR.

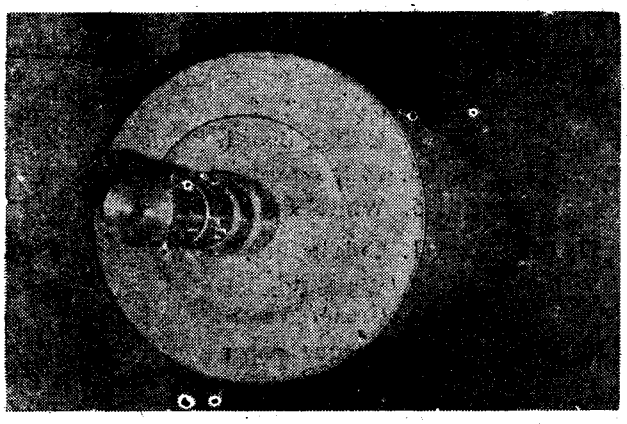


Fig. No. 2a
Top Press Roll
Sirpur Paper Mills Ltd.,
Sirpur Kaghaznagar.

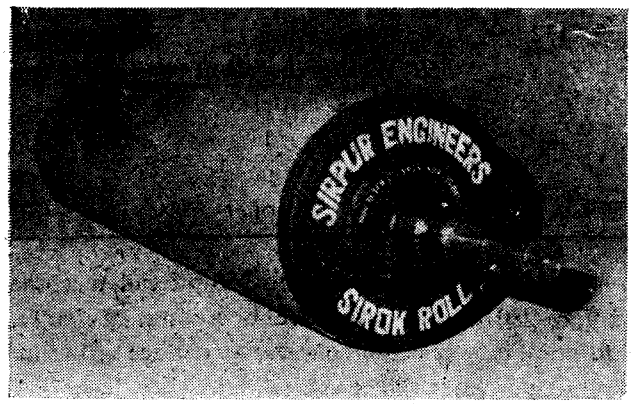


Fig No. 2b
Top Press Roll
Sirpur Paper Mills Ltd.,
Sirpur Kaghaznagar.

A number of top press rolls have been installed on in-house paper machine (Fig. 3a, b, c, d, & e) to conduct performance tests extensively with different grades of papers Results of the application of the rolls for the last ten continuous years are shown in Table. 1.

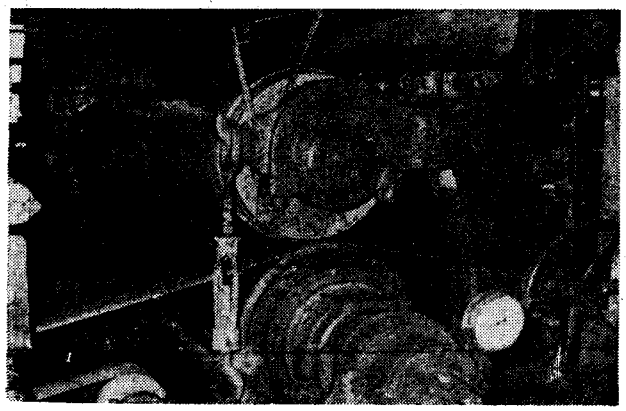
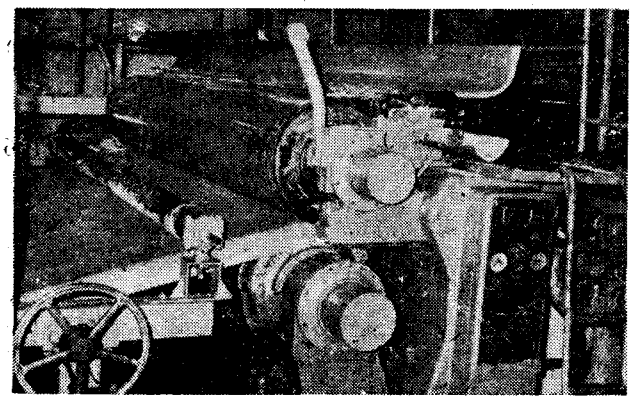


Fig. 3a.
Paper Machine No. 1
Top Press (Sirok) Roll runnning on first suction press at Sirpur Paper Mills Ltd., Sirpur Kaghaznagar



Flg. 3b

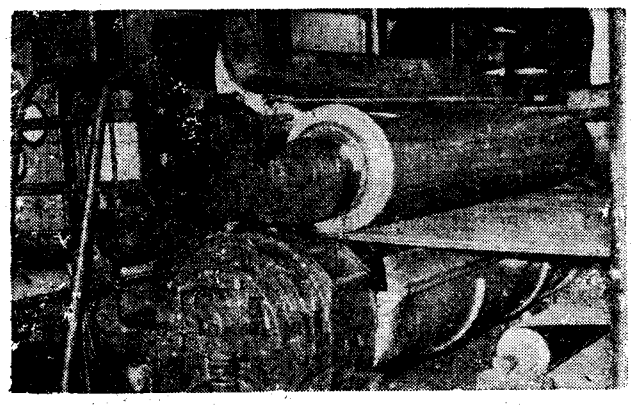


Fig. 3c

Fig. 3d.

Fig, 3e.

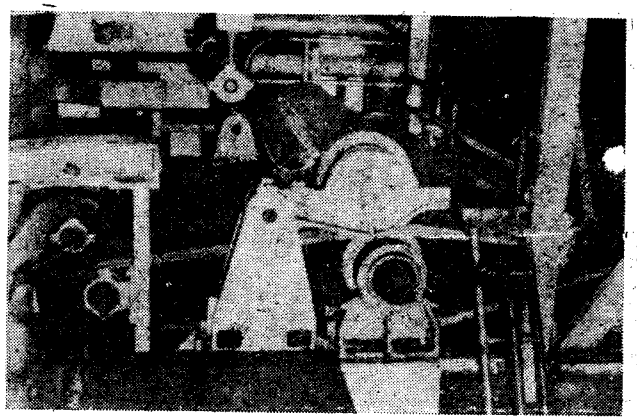


TABLE I

Paper Machines	Roll Dia-(mm)	Nip Pressure PLI 1st press	2nd press	Machine speed M/minute	Total Prodn. (M.T.) from 1978 to 1987	Paper grades	Remarks.
Paper M/c.1 (30 TPD)	560	170	—	150	1, 02, 955	1. unbleached Absorbent 2. Kraft 3. Unbld. Board 4. Mill Wrapper 5. White Ptg.	Suction Press
Paper M/c.3 (50 TPD)	610	—	190	280	1, 57, 018	1. Coiour Ptg. 2. White Ptg. 3. Cream Wove	Plain Press
Paper M/c. 4 (10 TPD)	450	120	140	106	26, 690	1. Cheque paper 2. Bible Paper 3. Apolo Bond 4. Air mail 5. Bank Paper 6. MICR 7. Map Litho 8. Chart Ptg.	1st Suction Press 2nd Plain Press
Paper M/c.5 (10 TPD)	450	120	140	71	19, 472	1. Duplicating 2. White Absorbent 3. Black Pastel 4. Pulp Board 5. Colour Ptg. 6. Mill Wrapper	1st Plain Press 2nd Plain Press

CONCLUSION

With over ten years in field application either for plain or suction presses, these rolls (under the trade name of "SIROK" roll) have proven their high quality, reliability and durability in thc production of many grades of paper from conventional, agro-based and recycled pulp furnishes. At Present nearly fifty rolls with diameter ranging from 305-625 mm, face length upto 4.0 Meter, nip pressure upto 250 pti and machine speed upto 250 metre/minute are operating efficiently. The duration betwecn two consecutivc surface grinding is about two years. The special grouting technique eliminates vibration and advanced design of the roll takes care of linear expansion due to temperature.

The design and development of the top press roll

from indigenously available natural rock, is the result of pioneering efforts of Sri K. M. Banthia, Vice President, The Sirpur Paper Mills Ltd. He has succcessfully applied modern techonology to this primeval and abundantly found indegenous material and developed a roll design that not only meets the operational demand of paper machine but also continues to save valuable foreign exchange for our country.

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