

Development of Protocol for Deposit Control in RCF Based Mills for Better Machine Runnability.

A Joint Project of CPPRI, INMA and EMAMI Paper Mill

By

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OBJECTIVE

To develop/ establish a methodology for measurement of Dissolved Colloidal Matter (DCM) to control deposition on paper machine.



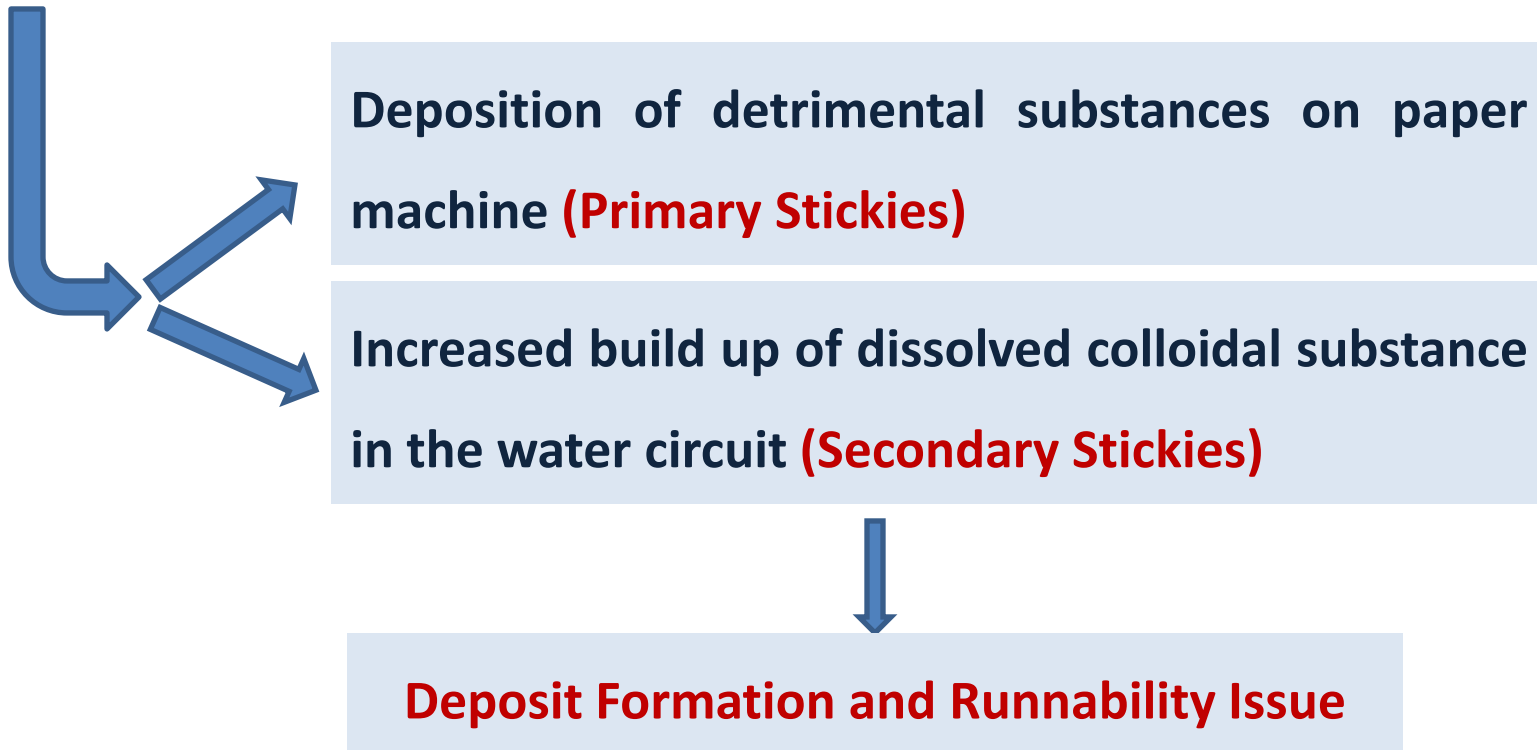
QUANTIFIED DELIVERABLES

- Development of protocol based on **Total Organic Carbon (TOC)** measurement techniques to determine **Effective Measurement of Micro-organics Accumulation (EMMA)** potential of mills to relate with paper machine runnability issues.
- Measurement of stickies and colloidal organics including pitch, Charge demand and Turbidity and their correlation with EMMA Potential.
- Implementation of protocol on mill scale for authentication.

PREAMBLE

Fastest growing trend in Paper Industry -

- **Reduced fresh water consumption through closing of water loop**
- **Increased use of recycled fibre to meet the growing demand of paper & paperboard.**



Primary Stickies Macro components which enters the paper machine system with raw material and remain insoluble.

Secondary Stickies Soluble dispersible substance which are released during stock preparation process when papermaking additives are added.

Due to system closure there is an increase in suspended solids, dissolved solids, colloidal material and temperature.

OCCURRENCE OF DEPOSITS ON PAPER MACHINE

Wet End Deposits (Press Part)

Occurs by precipitation of anionic colloidal material due to destabilization of the pulp suspension by the addition of cationic polymer (**governed by wet end chemistry**).

The selection of wet end chemicals is an important parameter to control deposits in this case.

Dry End Deposits (Dryers)

The Fine elements of fraction or microstickies (**< 100 μ size**) is the main origin of the deposit potential in recycled pulps.



BACKGROUND OF THE STUDY

- A new technology that measures colloidal organic was developed by **IPST at Georgia Tech., USA**
- The new technology which is based on a combination of fractionation and measurement of total organic carbon (TOC) has the potential for online effective measurement of micro-organic accumulation (EMMA) and was **validated under mill scale for packaging, newsprint and tissue paper grades by IPST.**
- Based on above a protocol has been developed at CPPRI to address the runnability issue of paper machine in Indian mills through Measurement of EMMA potential using TOC technique.



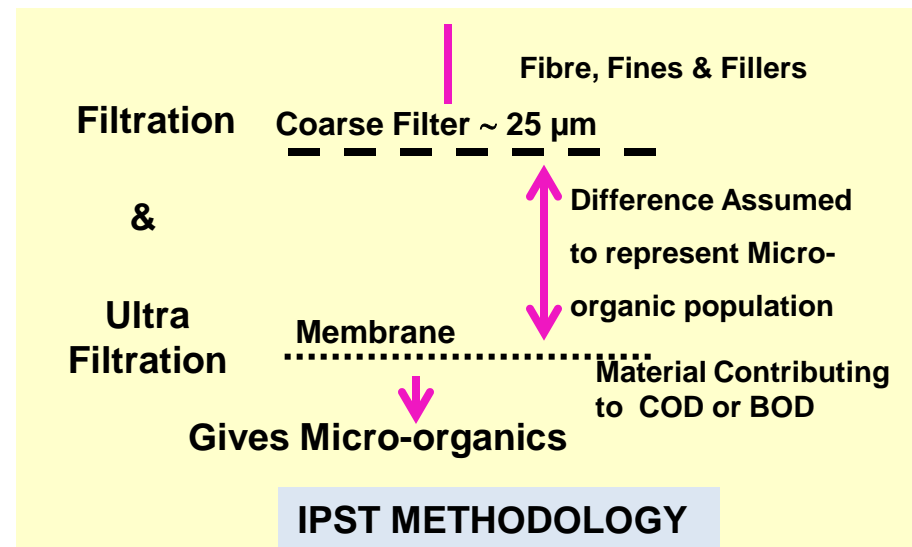
IPST METHODOLOGY

The method involves TOC measurement in ppm of two fractionated stream i.e.

< 25 micron (a)

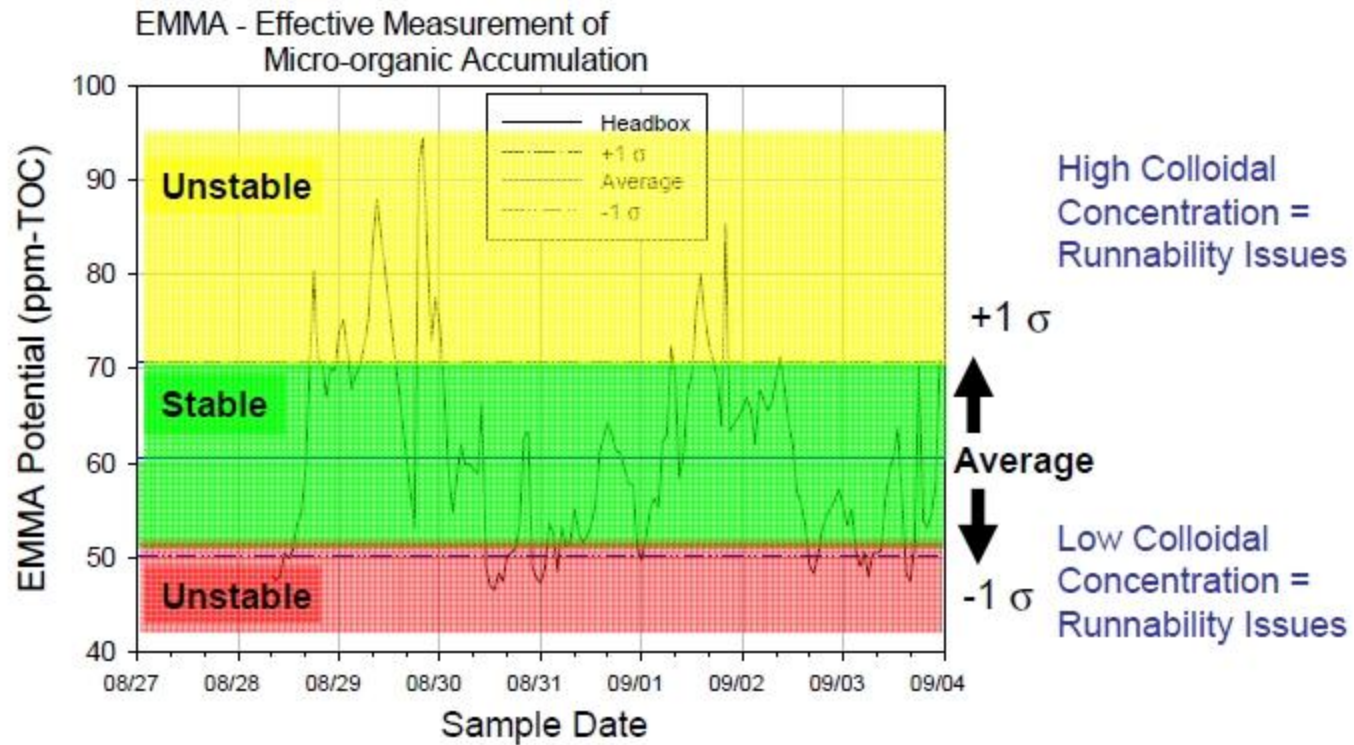
And

< 5000 Dalton fraction (b)



The difference of two measurements are calculated and reported as **EMMA Potential(a-b)**.

CASE STUDY - IPST



Source:

<https://www.researchgate.net/publication/228894656> Using the Measurement of Colloidal Organics to Relate to Paper Machine Runnability

As per IPST validated studies

If EMMA potential is

50 – 70 ppm



Stable System

less than 50 ppm



Low colloidal concentration

Leading to **Runnability Issue**

(Presumed that deposition already occurred)

more than 70 ppm



High colloidal concentration

Leading to **aggregation & deposition- web breaks**

DEVELOPMENT OF PROTOCOL BY CPPRI BASED ON IPST METHOD

In similar lines as per IPST, CPPRI developed the protocol/ methodology based on TOC and validated the findings with

Emami Paper Mills, Balasore (Stickies Deposition)

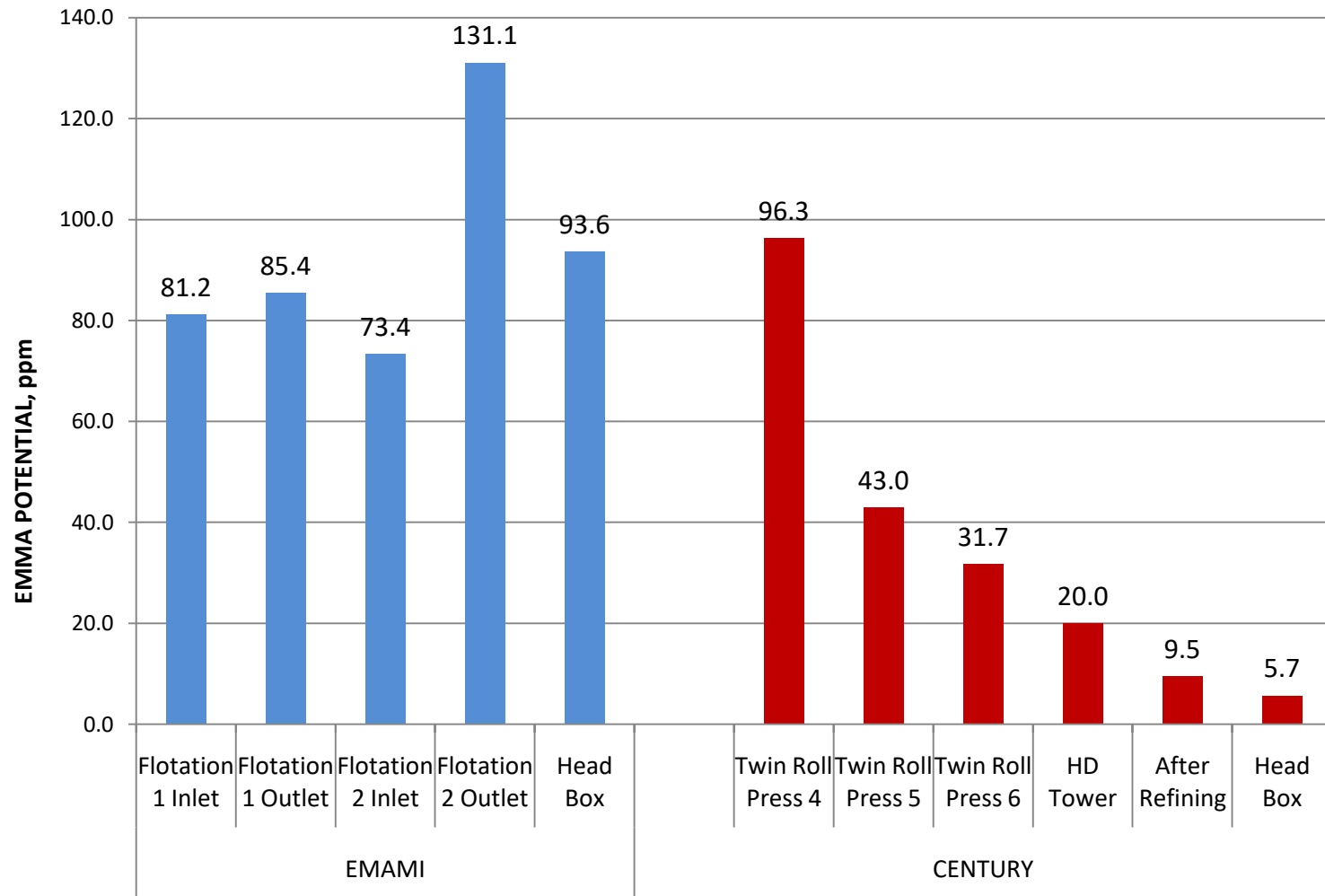
Century Pulp & Paper, Lalkua (Pitch Deposition)

The findings of EMMA Potential, determined for these mills were correlated with **stickies quantification, Turbidity and charge demand measurements.**

The protocol of EMMA Potential measurement based on TOC is fast (**5 minutes**) compared to stickies quantification with conventional method of DCM extraction (**6 hrs**).



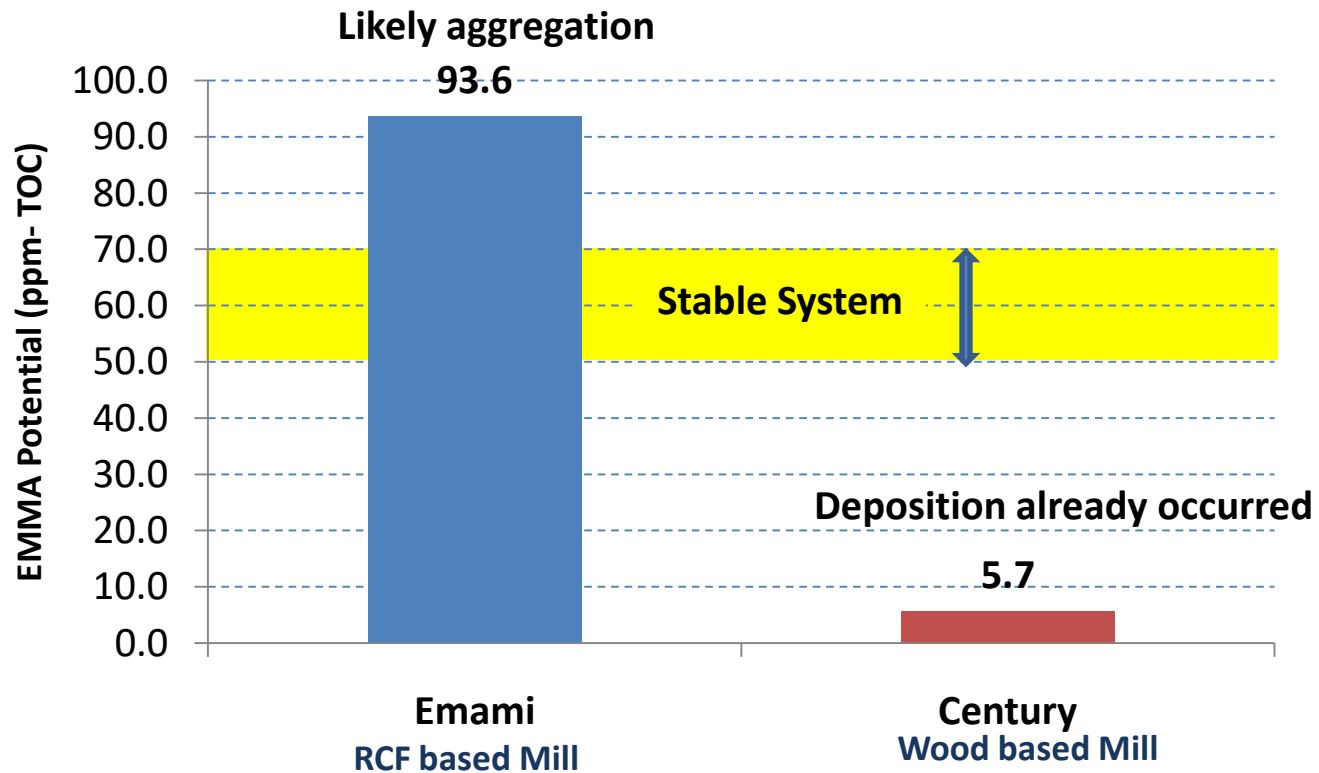
EMMA POTENTIAL DETERMINATION BY TOC TECHNIQUE



EMMA POTENTIAL DETERMINATION BY TOC TECHNIQUE

Head Box Sample

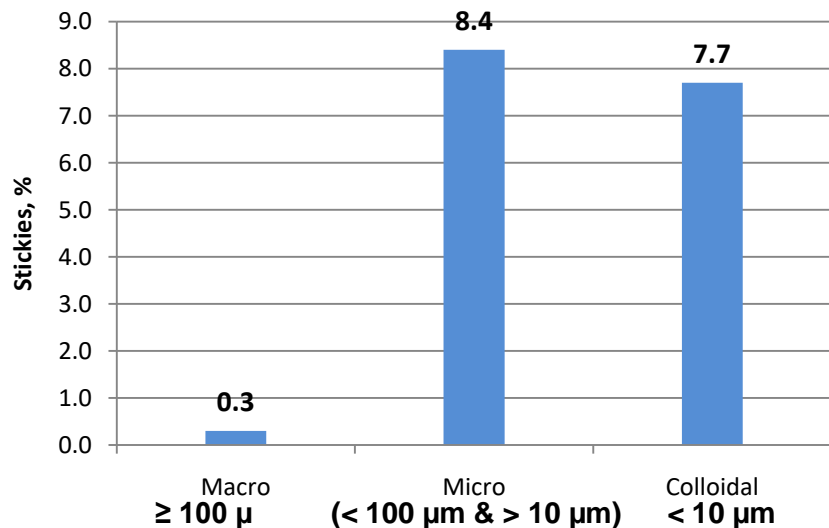
Total Time Taken- 5 min



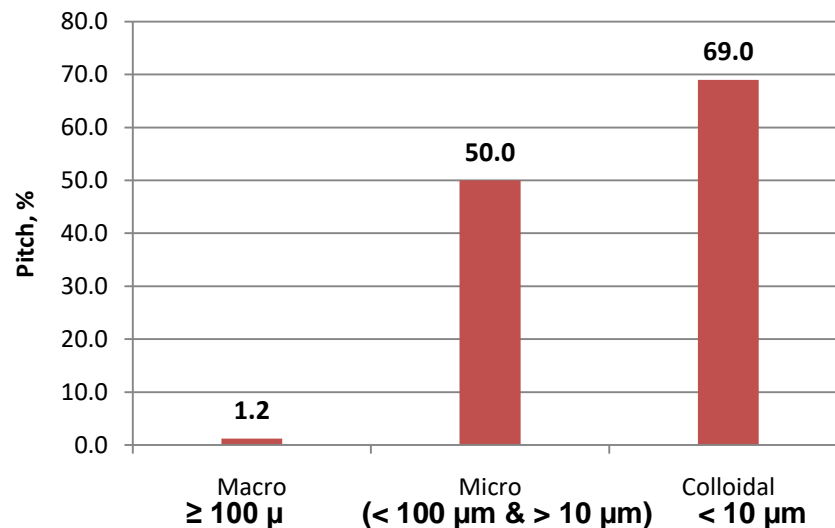
STICKIES/ PITCH DETERMINATION THROUGH CONVENTIONAL METHOD (DCM EXTRACTION TECHNIQUE)- CORRELATION

Head Box Sample

Total Time Taken- 6 Hrs.



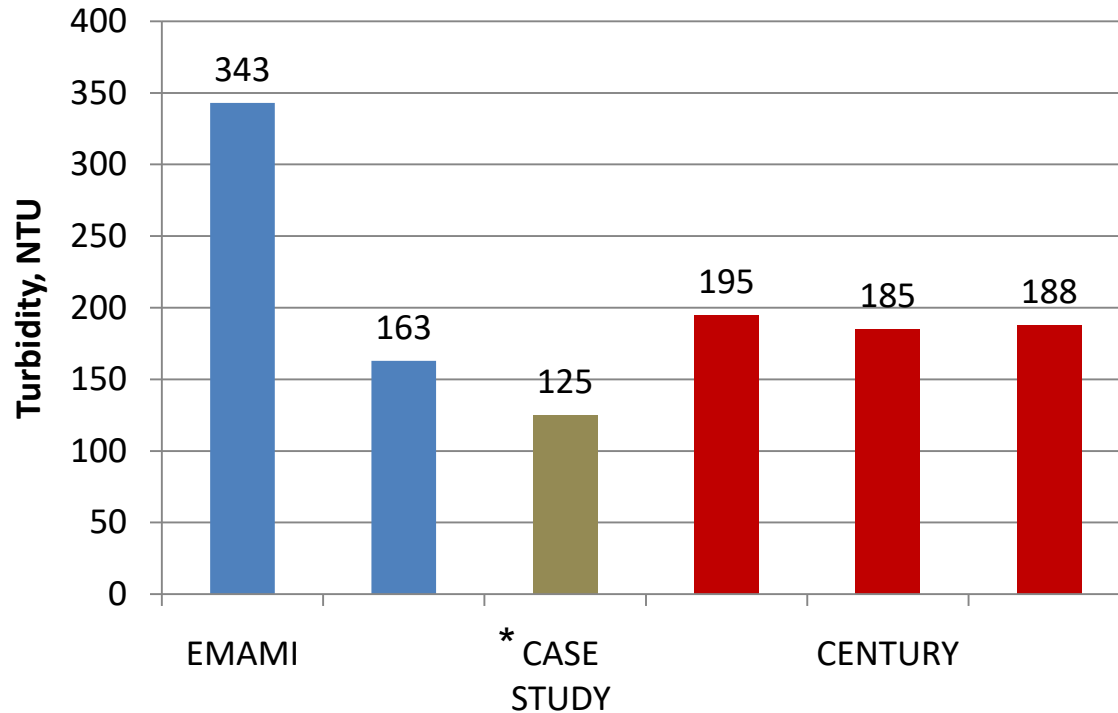
Emami Paper Mill
RCF based Mill



Century Pulp & Paper
Wood based Mill

As per reported literature, the presence of even 1% stickies in the pulp stock results to machine deposition leading to runnability issue.

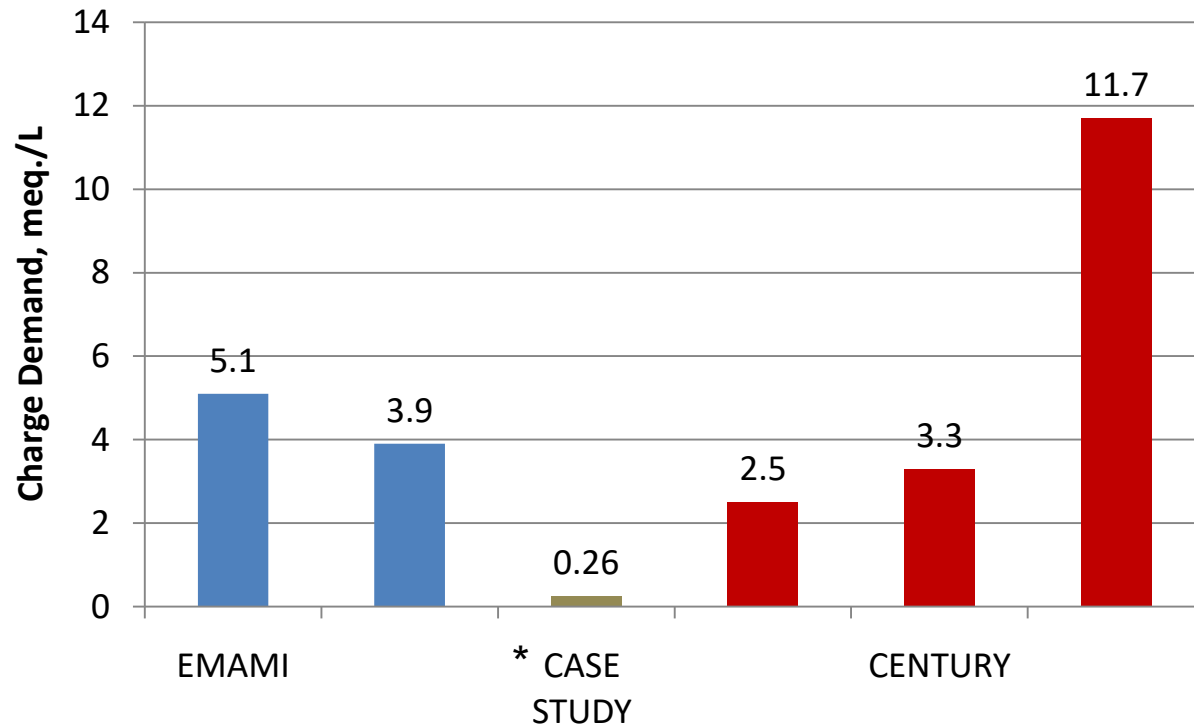
TURBIDITY MEASUREMENT- CORRELATION



** Source: Paper Technology July/ August 1996. Chemical Control of Deposits- Results of fixative trial.*

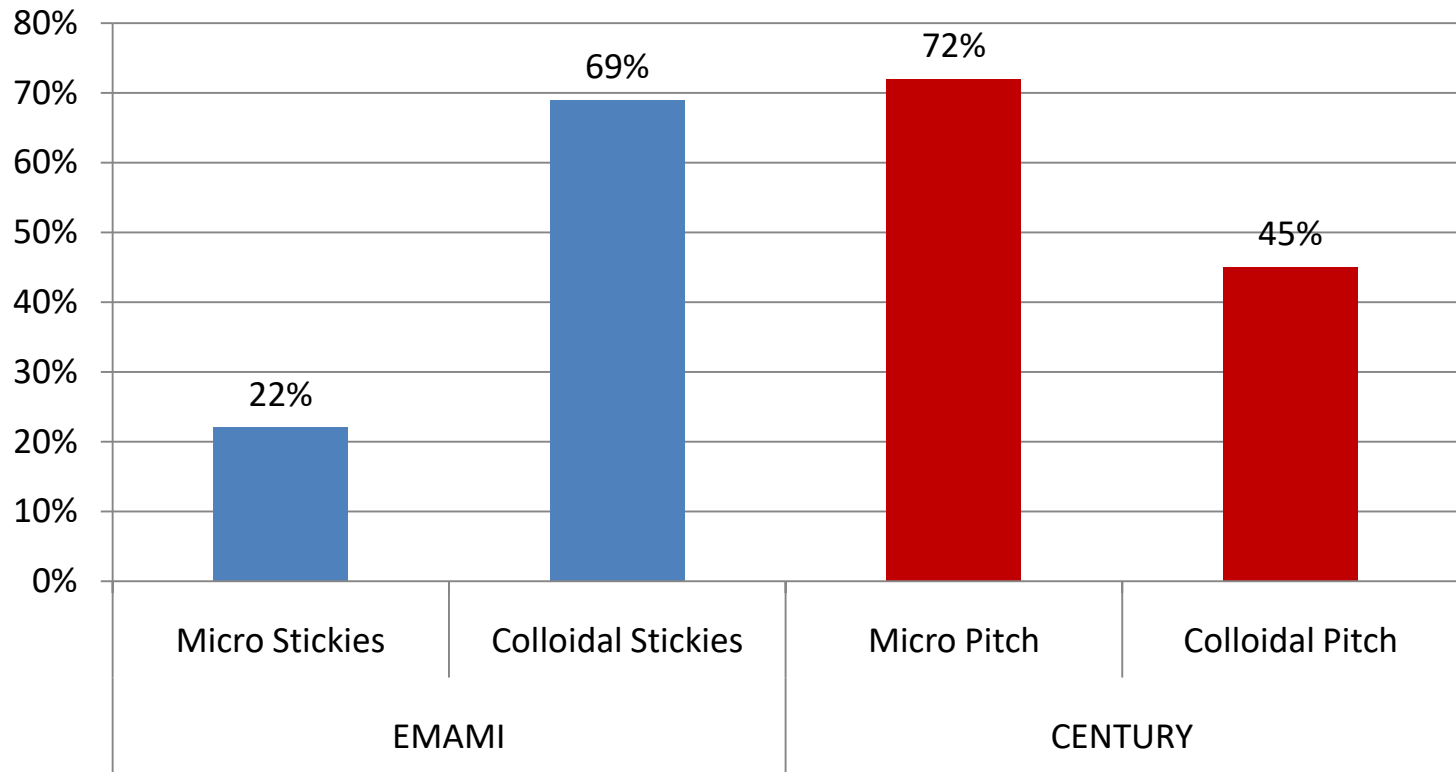


CHARGE DEMAND MEASUREMENT- CORRELATION

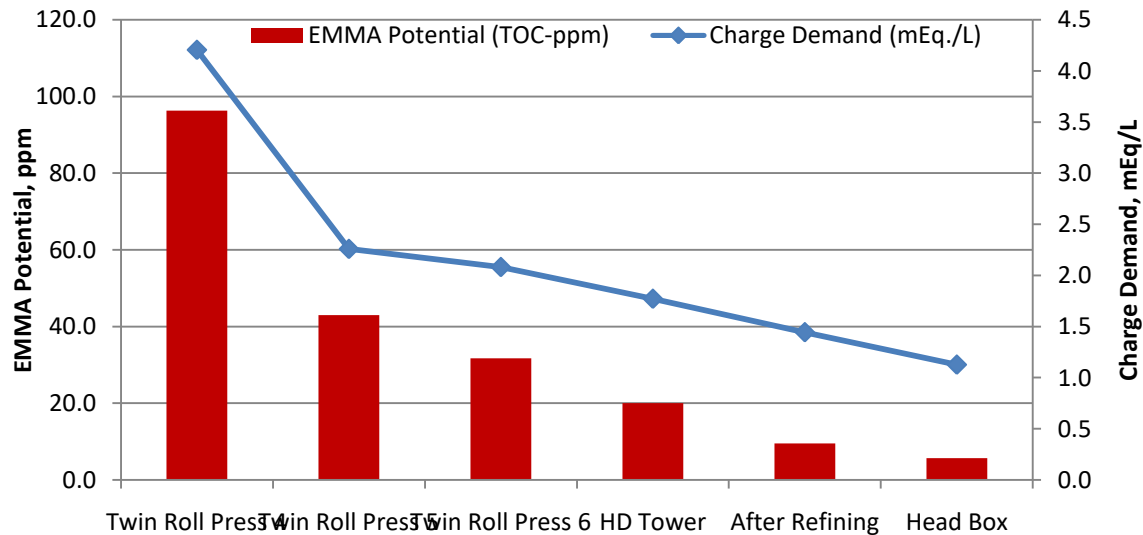
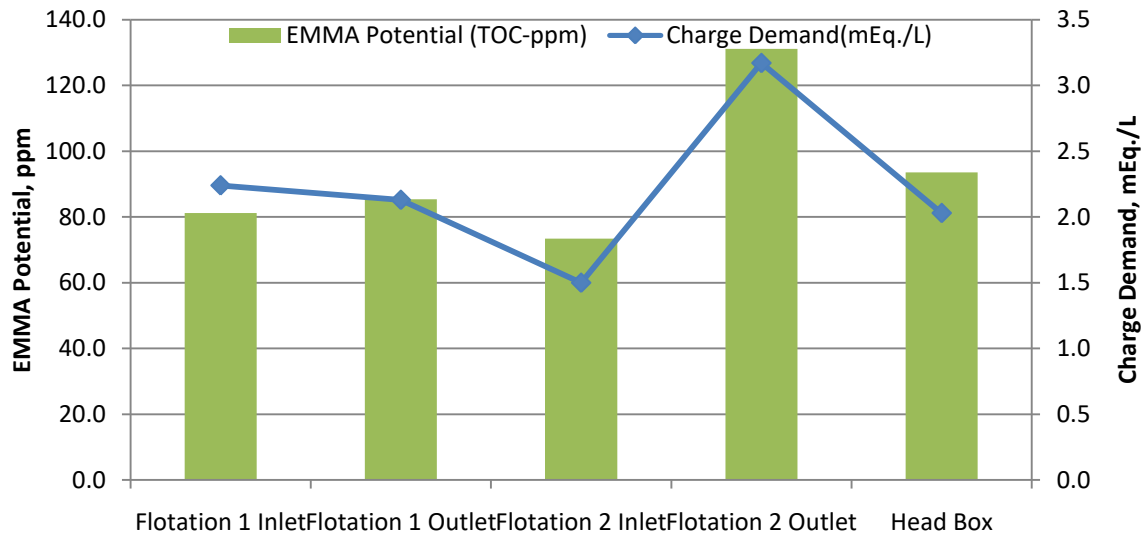


[* Source: Chemical Control of Deposits- Results of fixative trial - Paper Technology July/ August 1996.](#)

PAPER MACHINE BACK WATER- STICKIES/ PITCH CONCENTRATION



CORRELATION OF EMMA POTENTIAL WITH CHARGE DEMAND



OUTCOMES

- The conventional method of micro-organics determination based on DCM extraction method is very time consuming (6 hrs./ sample) hence can be replaced with new method.
- Measurement of EMMA potential based on TOC technique has been found to be an effective tool in quick assessment (5 min./ sample) of runnability issues due to presence of micro organics concentration in mills.
- The method is equally applicable to wood based mills for micro pitch accumulation.



CONCLUSION

- In the current scenario, study is very relevant as we are heading towards closing of water loop (ZLD).
- Studies have revealed that measurement of charge demand along with EMMA potential is an effective tool for quick assessment of runnability issues due to deposit formation.
- The developed protocol will help the mills to control the web breaks, m/c downtime, thus improving the productivity by controlling the EMMA potential of Head box.
- The protocol will be implemented in trouble shooting programs of interested mills for deposit control through appropriate wet end chemistry and deposit control programme.

