Failure analysis

Loop control problem at CR slitter

PROBLEM DEFINITION

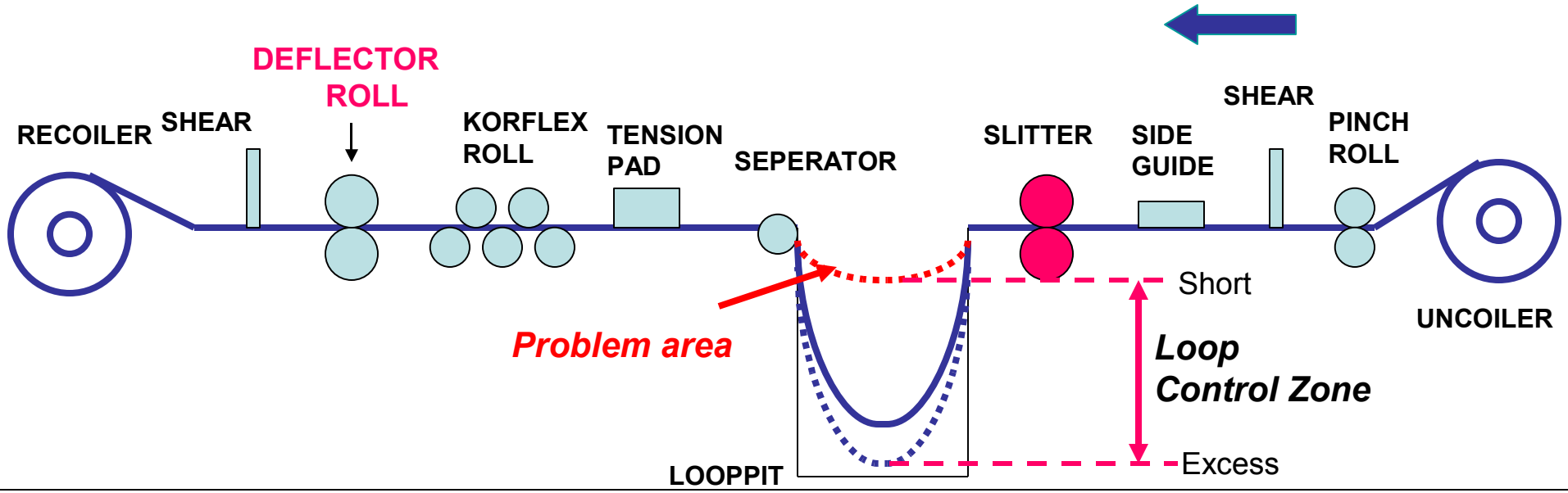
WHAT IS THE PROBLEM ?

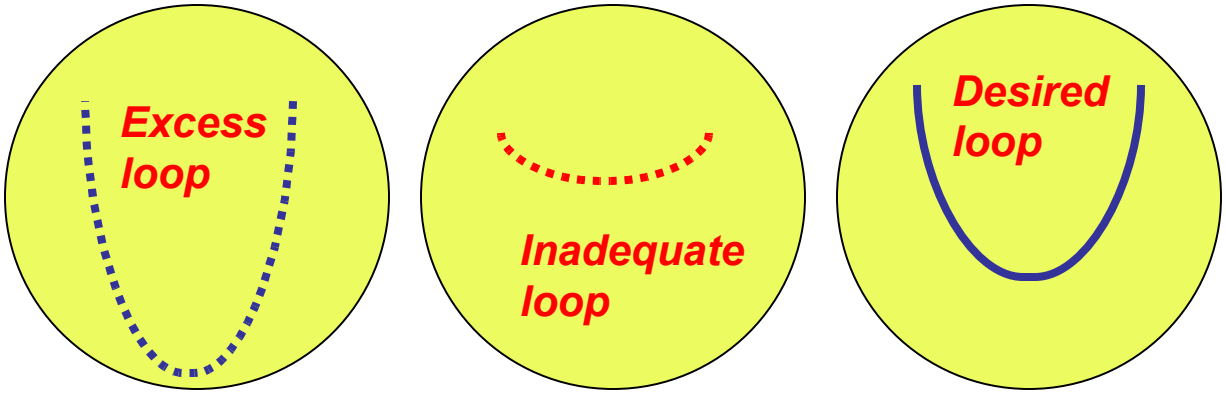
During slitting operation, strip loop gets shorten which is resulting in line stoppages and low performance rate

Type of Loss : Speed loss

ABOUT SLITTING PROCESS

SLITTER LAY OUT – CRC,WEST





HISTORICAL DATA

CR Slitter maximum line speed restricted to 120 MPM against designed line speed of 300 MPM

Speed Loss : 60%

PHENOMENON OBSERVATIONS

OBSERVATIONS AT SITE

1. Actual coil diameter on recolier was not matching with calculated diameter in PLC
2. Deflector passline found 2 mm above the reference level
3. Gravity type rust preventive oiling system to oil strip using deflector roll resulting in oil flooding between strip and roll surface
4. Deflector roll tachometer spur gear mechanism was intact

PHENOMENON OBSERVATION

Slippage data measured

Line speed Ref. (MPM)	Deflector speed (MPM)	Strip speed (MPM)	% Slip
50	48-50	50	0-2%
100	99-101	101	0-2%
150	145-150	162	7-10%
200	212-218	240	9-11%

% Slip varies non linearly as line speed increases

Note: Deflector speed; mpm and strip speed ; mpm reading are measured with portable digital tachometer.

PHENOMENON OBSERVATION

Actual coil diameter on recoiler was not matching with calculated diameter in PLC at line speed between 150 – 180 MPM.

Actual Diameter mm	Calculated diameter mm	% Error
715	670	-6.7
840	782	-7.4
961	890	-8.0
1279	1180	-8.4
1363	1250	-9.1
1477	1350	-9.4
1574	1435	-9.7
1718	1560	-10.1
1792	1625	-10.3

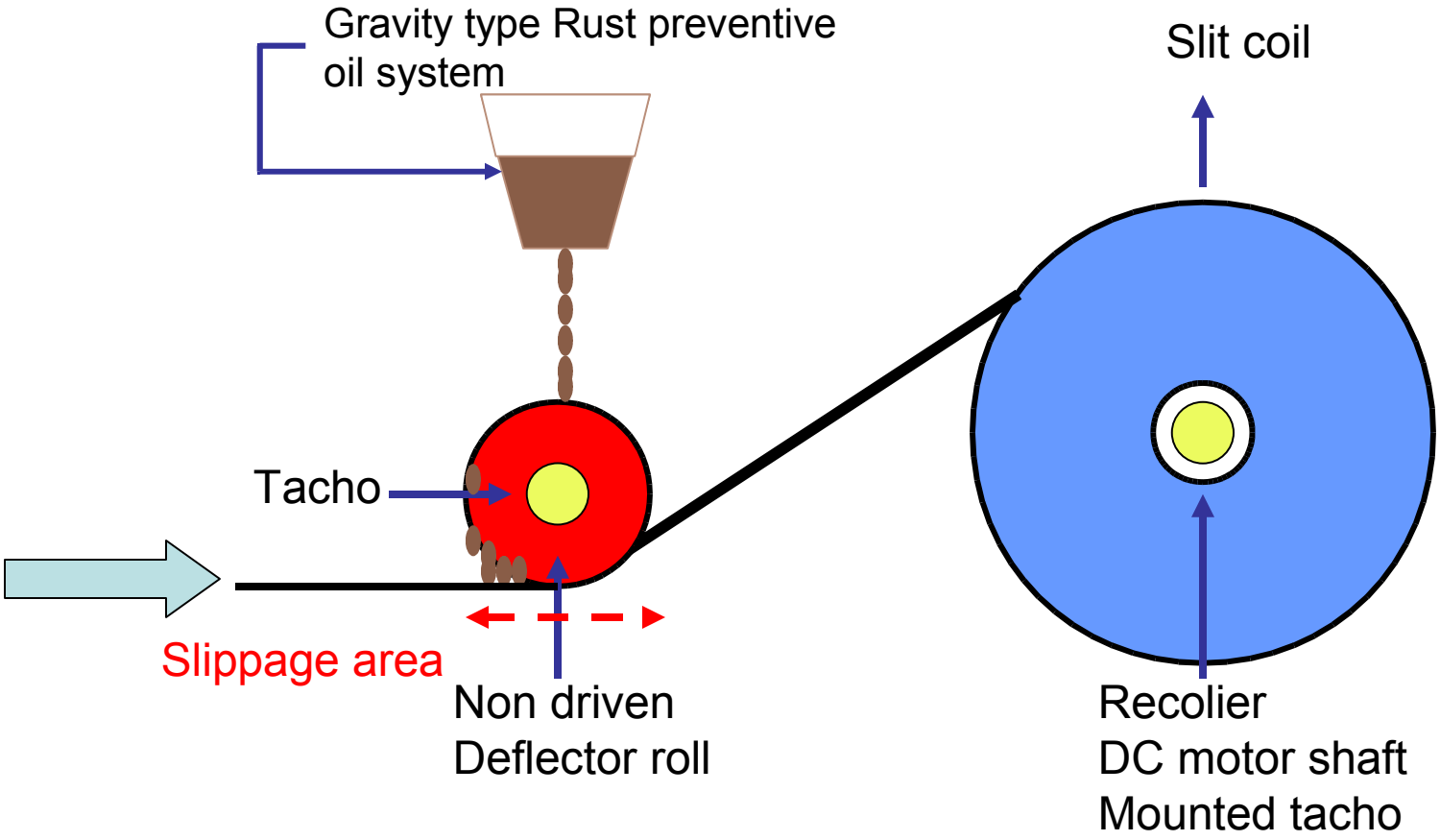
PHENOMENON OBSERVATION

Set deflector roll passline : lower it by 2 mm to match as per design Parameter.

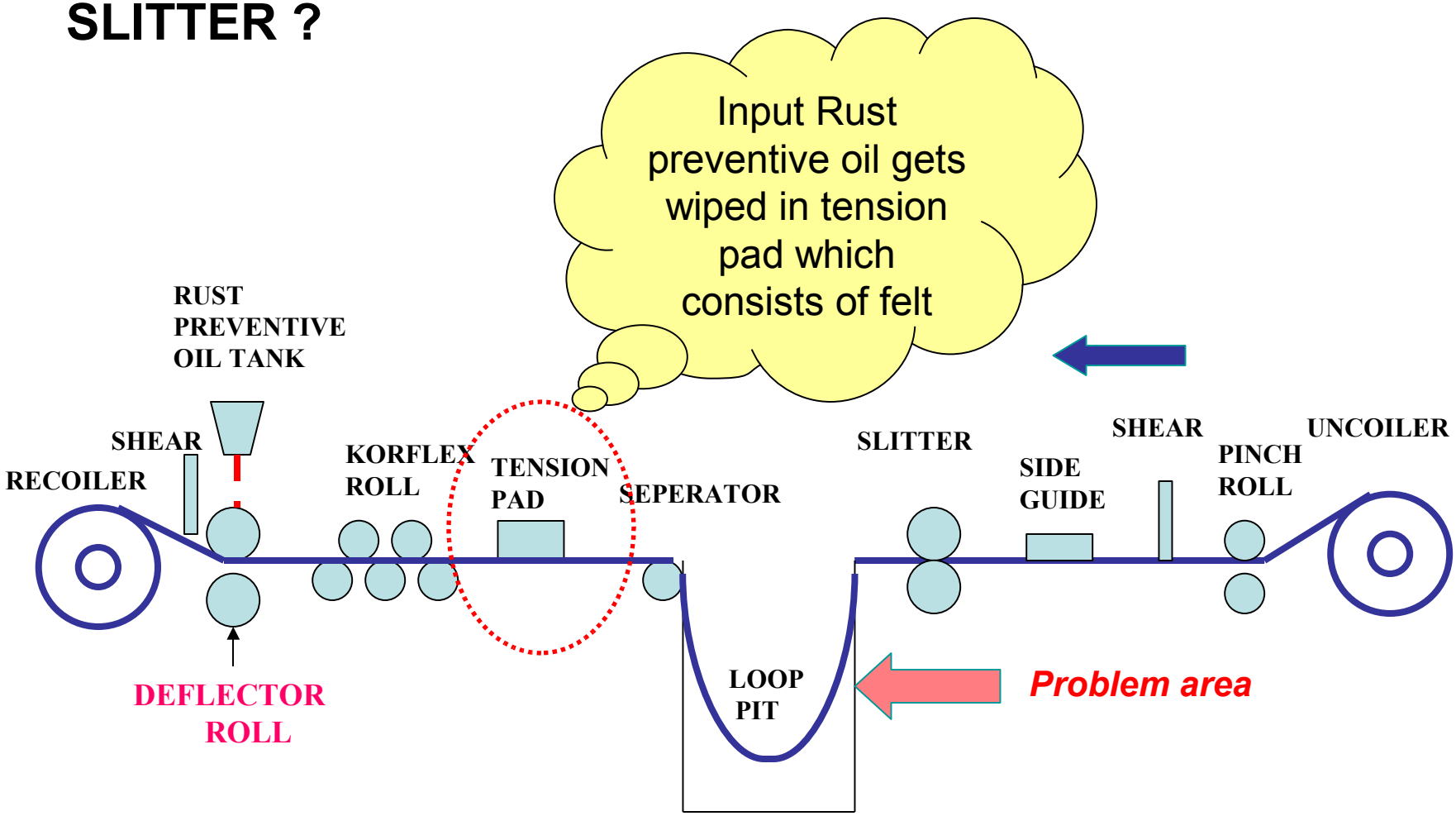
Hypothesis – Passline above designed level will result in change in wrap angle. This will increase slippage between deflector and strip

FURTHER OBSERVATIONS DONE

The deflector roll is oily as rust preventive oil is applied on it for strip oiling. The presence of oil in high amount results in non-linear slippage and effects measurement system.



WHY DO WE NEED TO APPLY RUST PREVENTIVE OIL AT SLITTER ?



The oiling was done through deflector as it gives uniform oiling on the strip surface

ROOT CAUSE IDENTIFICATION

- **We could understand that non-linear slippage at deflector roll is due to rust preventive oiling**
- **Recoiler diameter calculation not matching with actual diameter**

PLANNED SOLUTION

Non-contact diameter measurement system to be provided to get rid of this failure

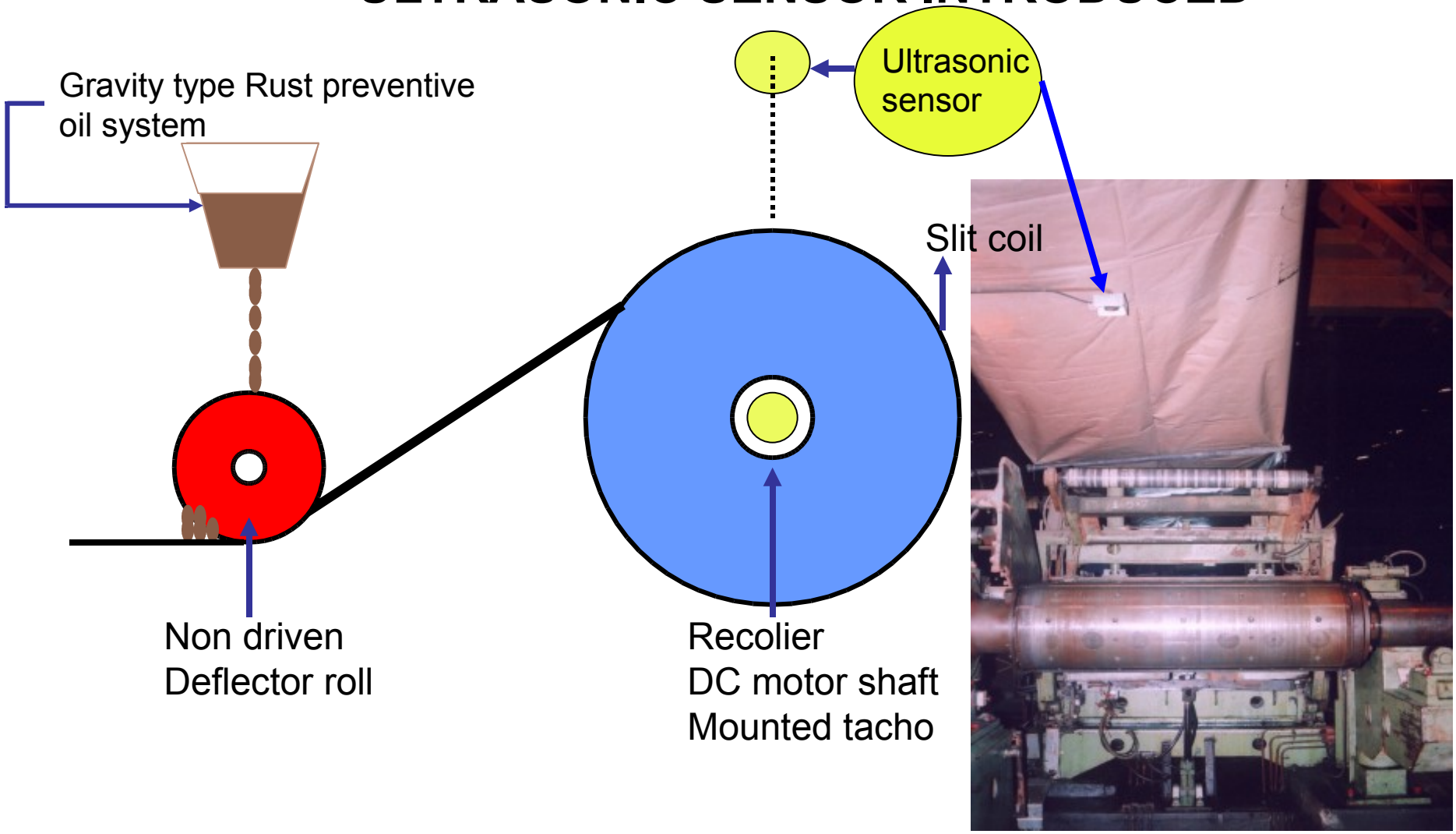
Type – ultrasonic sensor

Implementation date : 5th Jan 2004

Responsibility – S M Kolte – Sr Manager Maint.

Status – Completed

RECOILER DIAMETER COMPUTATION WITH ULTRASONIC SENSOR INTRODUCED



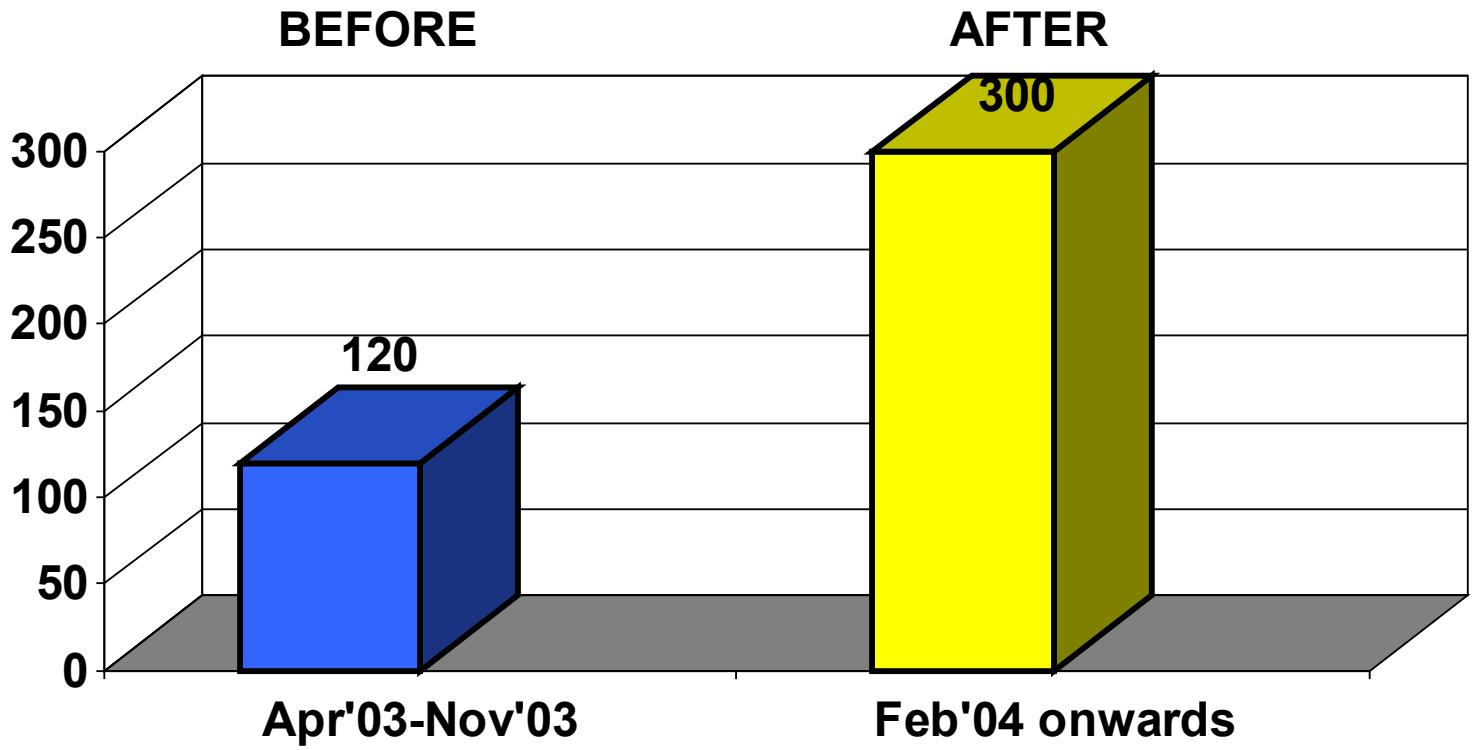
PHENOMENON OBSERVATION

Difference between actual coil diameter with calculated diameter display on control panel was within acceptable limit (± 1%) .

Actual Diameter mm	Calculated diameter mm	% Error
597	600	+ 0.5
696	700	+ 0.57
846	850	+ 0.47
1044	1050	+ 0.57
1154	1160	+ 0.52
1343	1350	+ 0.52
1443	1450	+ 0.48
1514	1520	+ 0.39
1744	1750	+ 0.34

RESULT: MAXIMUM LINE SPEED ; MPM

MAXIMUM LINE SPEED ; MPM



Thank You

WHY LOOP IS DESIRED IN SLITTER PROCESS ?

Loop is essential to compensate difference in slit lengths which is because of shape profile across the strip width (centre & Edge wavy)

HOW DOES LOOP CONTROL WORK ?

- **Slitter and Recoiler operate in speed control loop**

- **Slitter speed can be adjusted by operator through ten turn potentiometer to control loop between SHORT and EXCESS LOOP limit**

- **For Recoiler Diameter computation deflector roll tachometer and Recoiler motor shaft tachometer feedback taken as input to PLC**