



# JK PAPER LTD. UNIT: CPM



## IPPTA PRESENTATION

OVER ALL IMPROVEMENT IN CHEMICAL RECOVERY AND LIME  
KILN BY INNOVATION AND OUT OF BOX THINKING

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**CPM**  
**Present Capacity , 145000 TPA**

**Pulp & Paper Plant**

**Packaging Board Plant**

- Commenced production in 1968
- Acquired by JK Group in 1992
  - Turn around in 1994-95
  - Capacity: 55,000 TPA
- Products: Copier paper, writing printing paper, industrial grade & security paper

- Commenced production in 2007
- Capacity: 90,000 TPA
- Products: Multi Layer Virgin Grade Packaging Boards



## Introduction:

- In Indian Pulp and Paper Industries, many Mills have adopted latest technologies with their capacity expansion of Pulp Mill, Chemical Recovery and Paper & Board Machines.
- The Mills still having old conventional technologies also marginally have increased their Pulp Mill capacity by debottlenecking of the plant, resulting in generation of additional Black Liquor and putting additional load on exiting Chemical Recovery

- **Installed capacity of Pulp Mill was 30,000 MT PA.**
- **Acquired by JK Group in 1992 and capacity was 40,000 MT PA, which was debottlenecked by applying innovative ideas.**
- **Pulp Mill capacity has increased to 60,000 MT PA.**
- **Fibrous raw materials being used are Bamboo (25-35%), Eucalyptus, Subabul and Casuarina.**
- **The pulping process is Kraft process.**

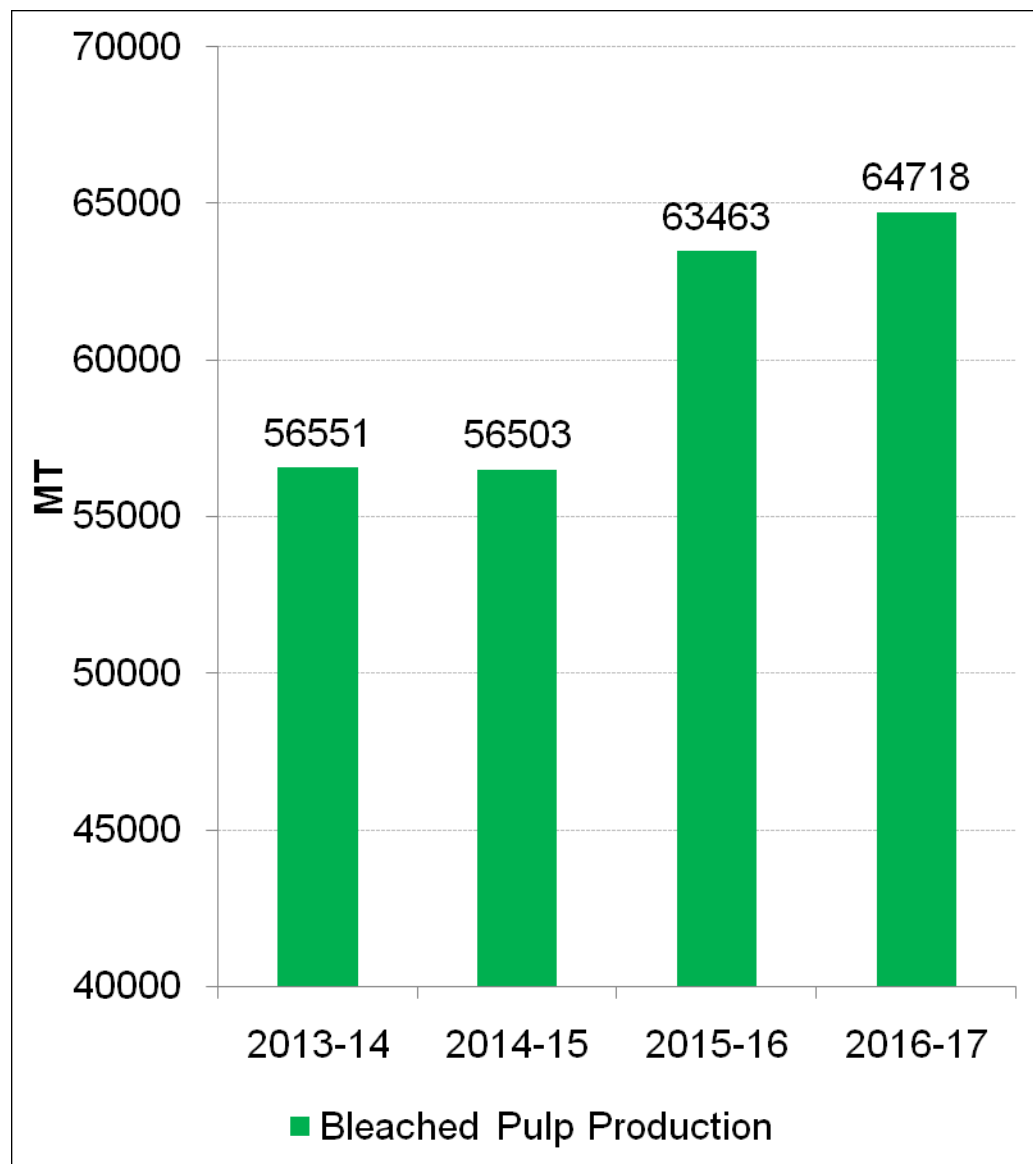
➤ **Bleaching followed by two stage Oxygen Delignification (ODL).**

➤ **By enhancing Pulp Mill capacity, generation of weak black liquor from Pulp Mill has increased and demand of white liquor has also increased at digester house to cook desired Nos of digester, resulting in load increase on existing Chemical Recovery**





## Bleached Pulp Production (MT)



## Characteristics of Weak Black Liquor

Sr. No.	Parameter	Value
1	Total Solids, % w/w	17.3
2	Free Alkali as Na <sub>2</sub> O	6.6
3	Inorganics, % w/w	52
4	Organics, % w/w	48
5	GCV, k cal/kg	3045
6	SVR, ml/g	30
7	Sodium as Na, % w/w	18.9
8	Carbon as C, % w/w	33.2
9	Hydrogen as H, % w/w	3.8
10	Nitrogen as N, % w/w	0.70
11	Sulphur as S, % w/w	1.5
12	Chloride as Cl, % w/w	1.6
13	Silica as SiO <sub>2</sub> , % w/w	1.2

## The major challenges faced in Chemical Recovery due to old conventional technologies in Chemical Recovery :

- **Bottleneck of Evaporator plant.**
- **Lower Black Liquor solids output from cascade evaporator.**
- **Lower Black Liquor solid firing at Recovery Boiler.**
- **Silica problem in Evaporators, Causticizing plant and Lime Kiln as using Bamboo (25-35%) in raw material furnish.**
- **Higher operating cost of Lime Kiln.**

**Innovative Ideas were Implemented for the over all improvement in Chemical Recovery and Lime Kiln**

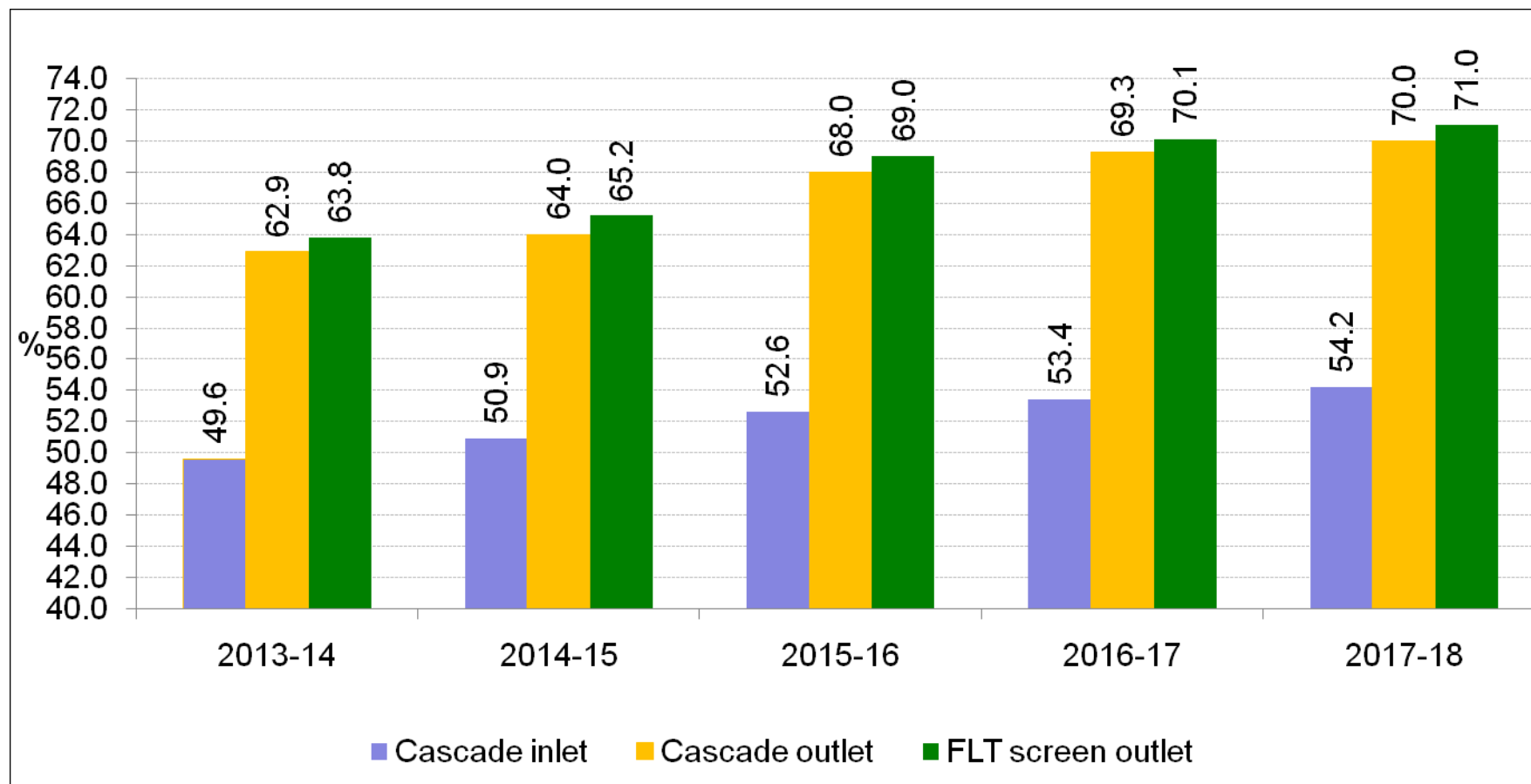




## 1.0 Increase of black liquor solids of Cascade Evaporator

- The existing evaporator capacity was 57 T/ hr water evaporation.
- Two extra bodies were shifted from Unit:JKPM, successfully installed and commissioned in 2014-15.
- There are total 11 Nos of bodies. In first effect there are 3 Nos of bodies (lamella type) and remaining 8 are tubular type. In 2<sup>nd</sup>, 3<sup>rd</sup> & 4<sup>th</sup> effects there are 2 Nos of bodies in each effect and in 5<sup>th</sup> & 6<sup>th</sup> effect there is only single body in each effect.
- Capacity increased from 57 to 65 T/hr water evaporation by adding two additional bodies.

## Trends of Black Liquor solids at different stage of Evaporator:



## 2.0 Chemical Recovery Boiler:

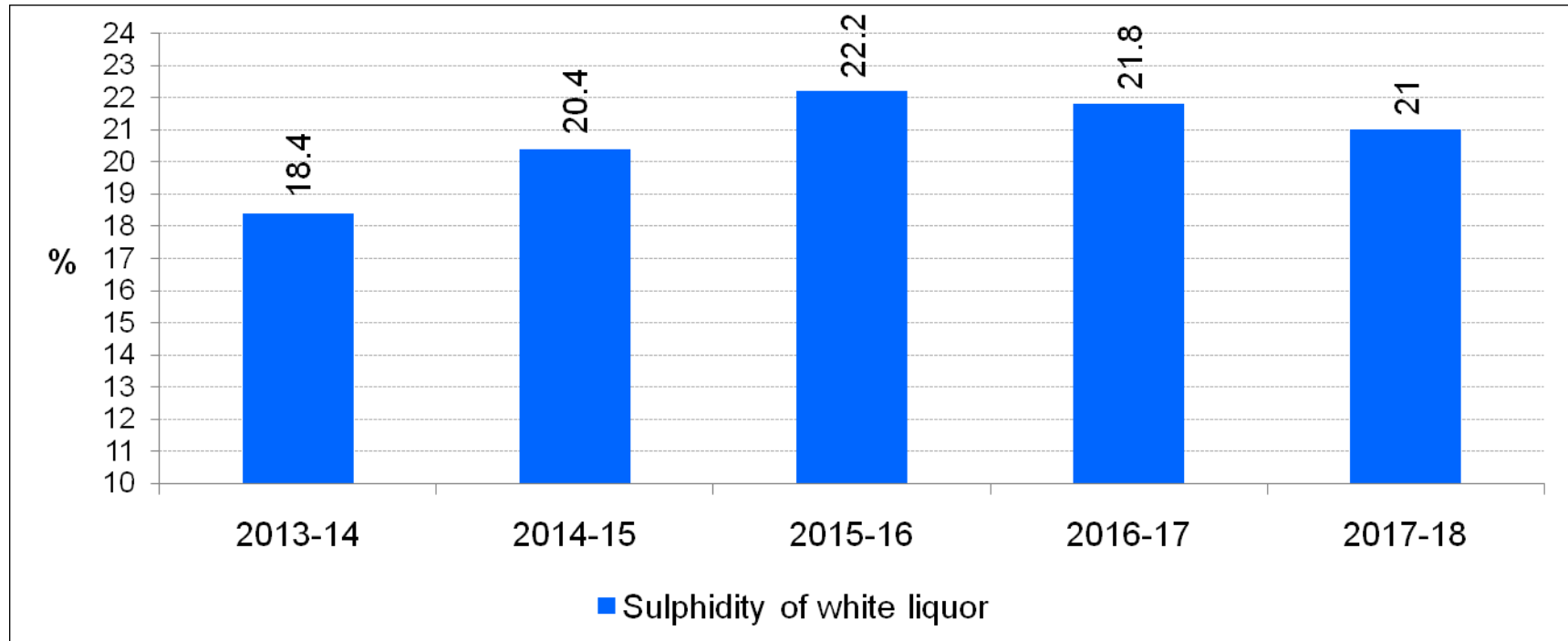
Recovery Boiler was designed for firing of 335 T dry solids per day.

By increasing firing liquor solids the additional advantages observed at Recovery Boilers were.

- Reduction in cascade jamming problem.
- Uniform char bed on hearth by controlling primary and secondary air duct pressure.
- Less liquor carry over.

- Firing liquor pressure reduced from 1.2 kg/cm<sup>2</sup> to 0.7 kg/cm<sup>2</sup> by increasing firing header size from 3 inch to 6 inch, it helped to minimize black liquor carry over.
- Reduction from sodium sulfate to sodium sulfide increased.
- Sulfidity of white liquor increased.
- Sustainability of Boiler
- Advantage of inlet temperature at ESP
- By increasing black liquor solid, runnability of Recovery Boiler has been increased resulting no furnace oil is being used, except for startup & shut down.

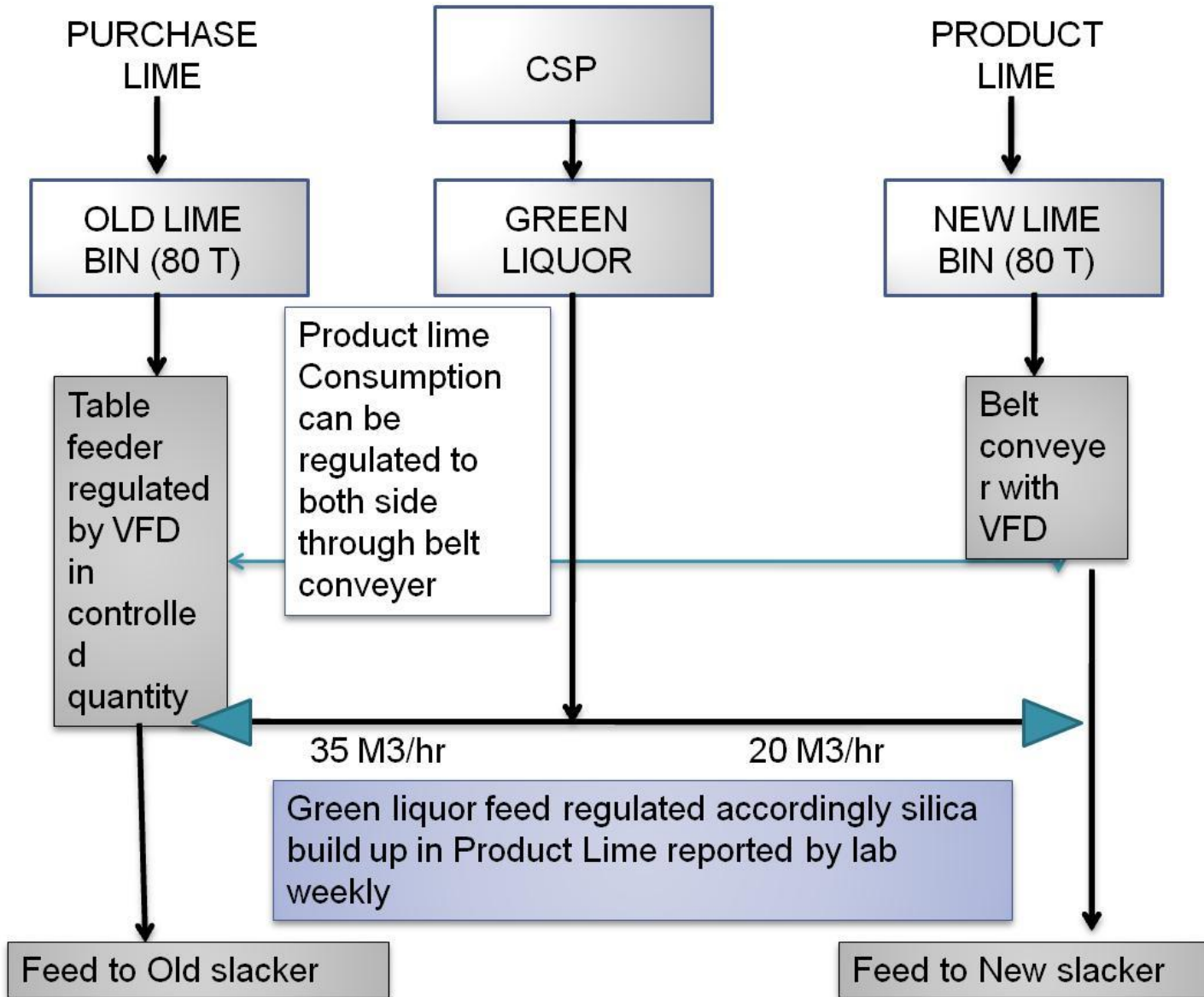
## Sulfidity of White Liquor :



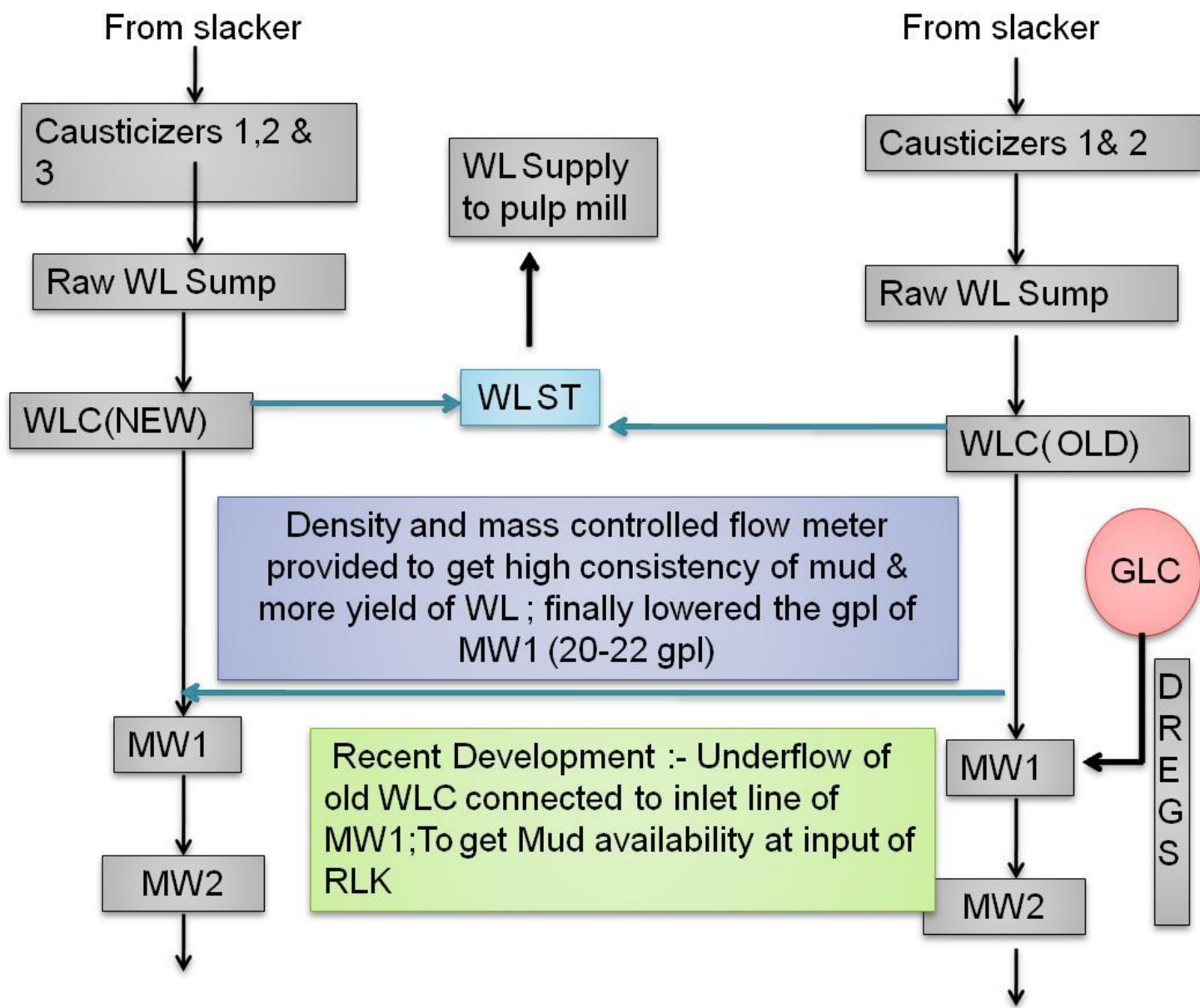
## 3.0 Causticizing Plant:

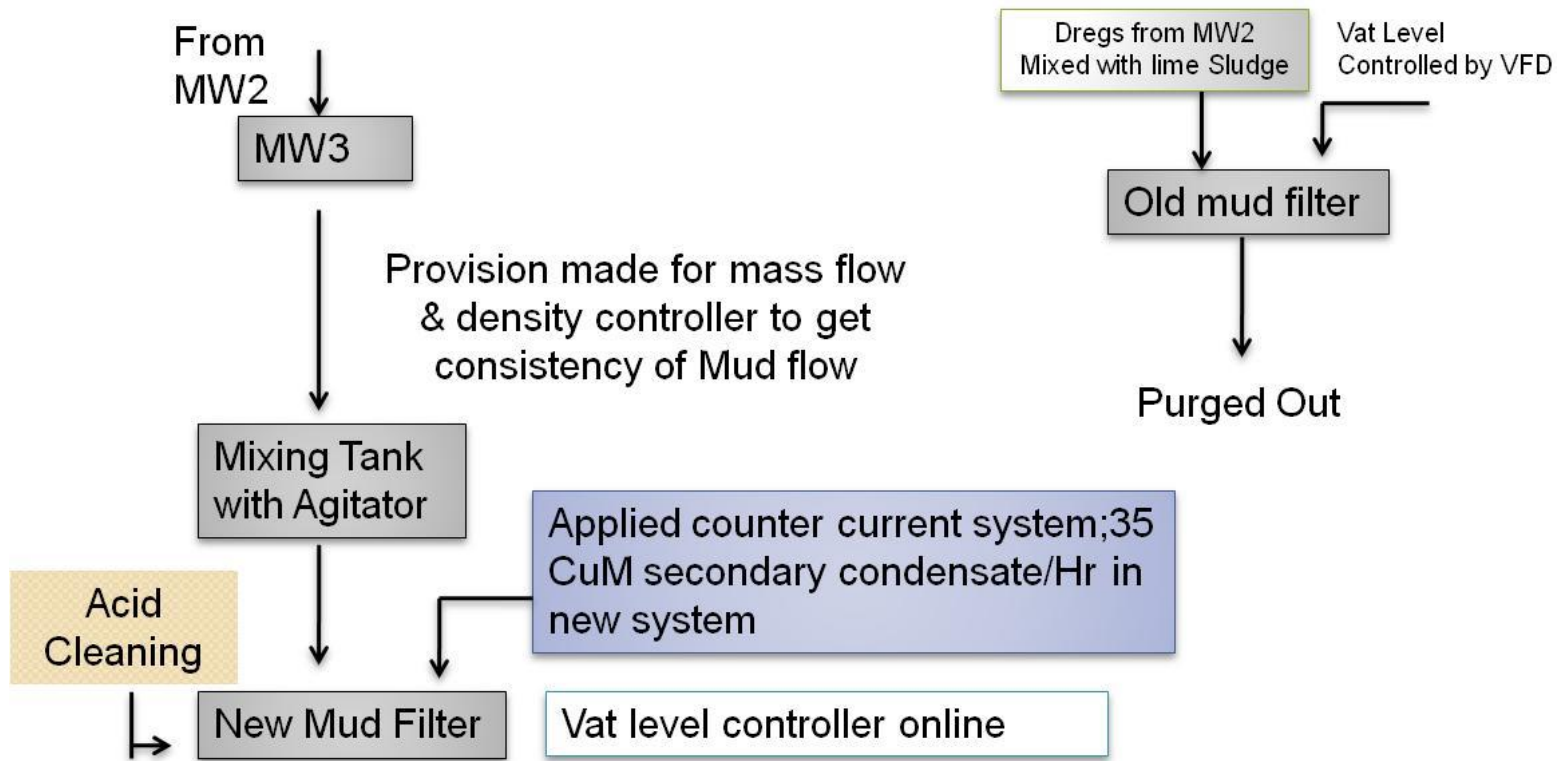
- **White liquor production capacity of causticizing plant was 78 T/day.**
- **Using Bamboo in raw material furnish (25-35%).**
- **Silica content in bamboo is higher as compared to hard wood.**
- **To increase the white liquor production capacity, causticizing plant diverted into two streams. White liquor generation increases from 78 TPD to 110 TPD.**

# Process flow diagram of Causticizing Plant:









### Silica content in Black Liquor, Green Liquor & White Liquor:

Sr No	Particular	Unit	2013-14	2014-15	2015-16	2016-17	2017-18
1	Black Liquor	gpl	1.8	2.0	2.5	2.4	2.2
2	Green Liquor	gpl	1.4	1.7	2.0	1.9	1.8
3	White Liquor	gpl	0.58	0.57	0.74	0.68	0.62



## 4.0 Rotary Lime Kiln with producer gas plant :

- **Rotary Lime Kiln with Producer Gas Plant was installed and commissioned in 2009-10.**
- **Installed capacity of Lime Kiln is 90 TPD, running with Producer Gas Plant.**

## 4.1 Key points to reduce the furnace oil consumption is zero

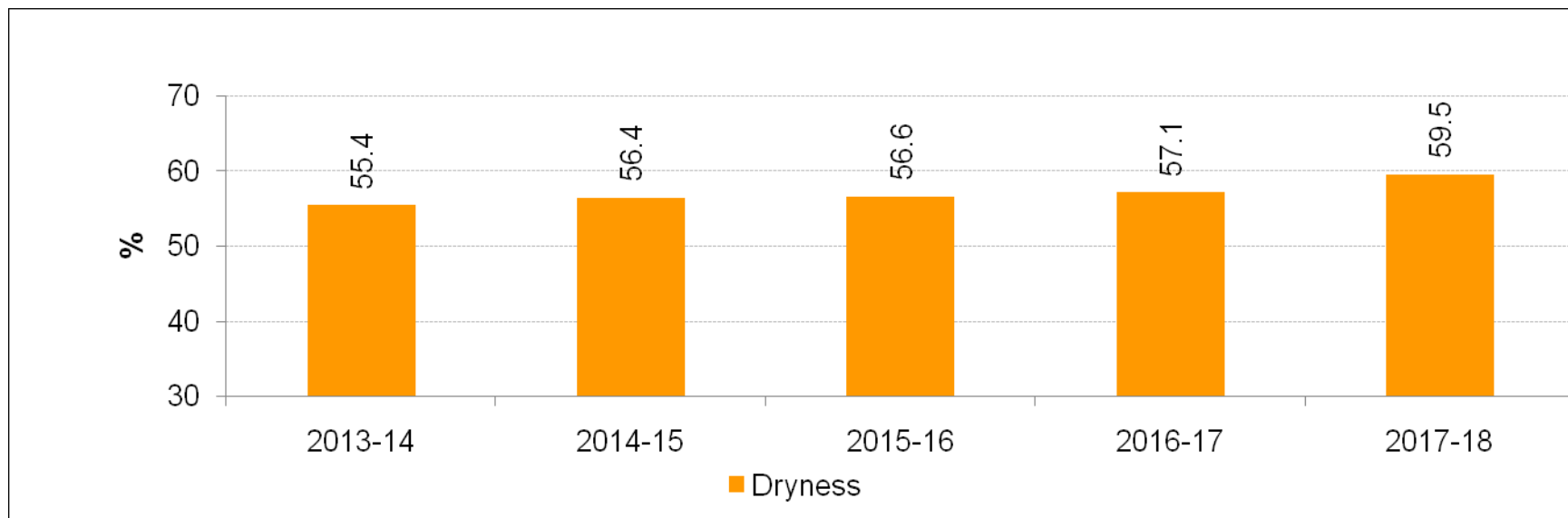
- Segregation of Green Liquor flow in two parts (35 M3/hr and 20 M3/hr), resulting white liquor generation increases from 78 TPD to 110 TPD.
- Both street generated lime mud handled and wash separately .
- Lime mud generated from product lime is purged out as silica contained in the system.

### Acid Insolubles in Lime sludge & Product Lime

Sr. No.	Particulars	Unit	2013-14	2014-15	2015-16	2016-17	2017-18
1	Lime sludge from New filter	%	5.4	6.5	6.4	5.4	3.6
2	Product Lime	%	8.1	9.4	9.7	8.3	6.7

- Lime mud generated from purchased (35% of total lime consumed) and from product lime is feeded to lime kiln.
- Purchase lime is used as make up (35% of total lime consumption) in place of lime stone.

## Filter Cake Dryness :



## 4.2 Optimization of operation at mud filter

**Mud density : 1.14 gm/cc**

**Vat level : 30 %**

**Slurry temperature : 85°C**

**Slurry flow : 13.5 cum/hr**

**Vacuum : 550 mm hg**

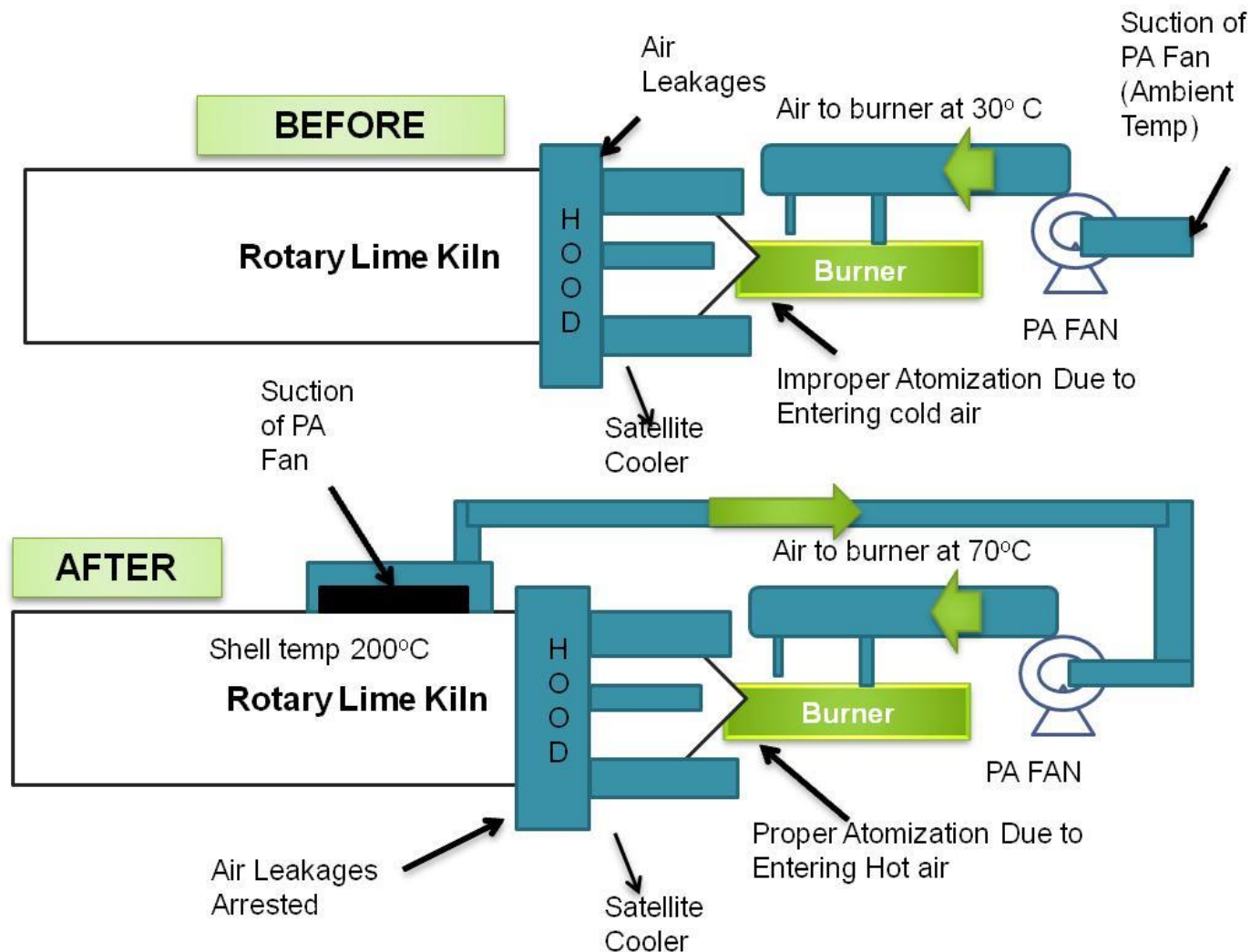
- **Assured counter current washing system.**
- **Checking of doctor blade & its gap weekly.**
- **Online effective acid cleaning system provided.**

## 4.3 Optimization of operation at Rotary Lime Kiln

- Adjustment of flame by regulating radial & axial primary air flow.
- Primary air pressure controlled (550 to 360 mmwc )
- Short circuiting of secondary air is arrested.
- Temperature of primary air is increased, from ambient to 75°C .
- ID fan RPM is controlled as per balanced draft.

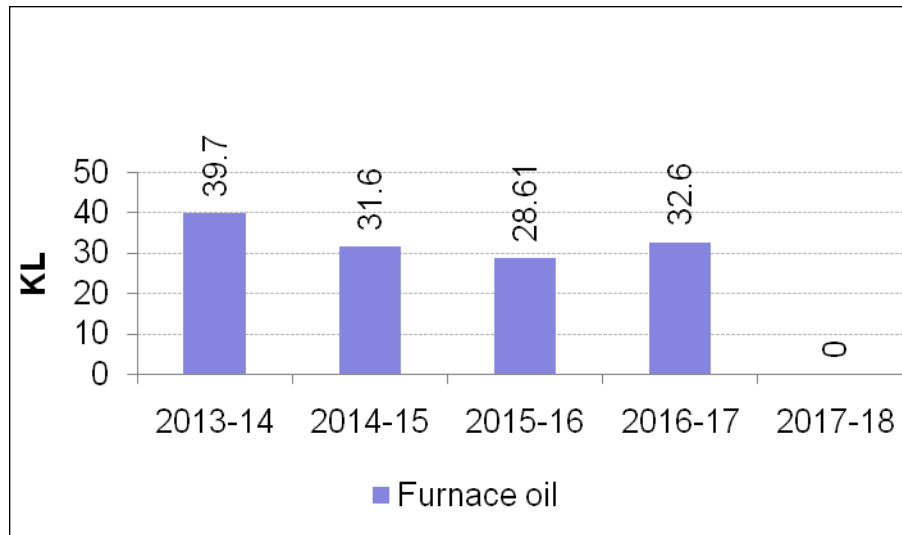


## Primary air changed from ambient air to 75°C by modifying suction duct near kiln shell

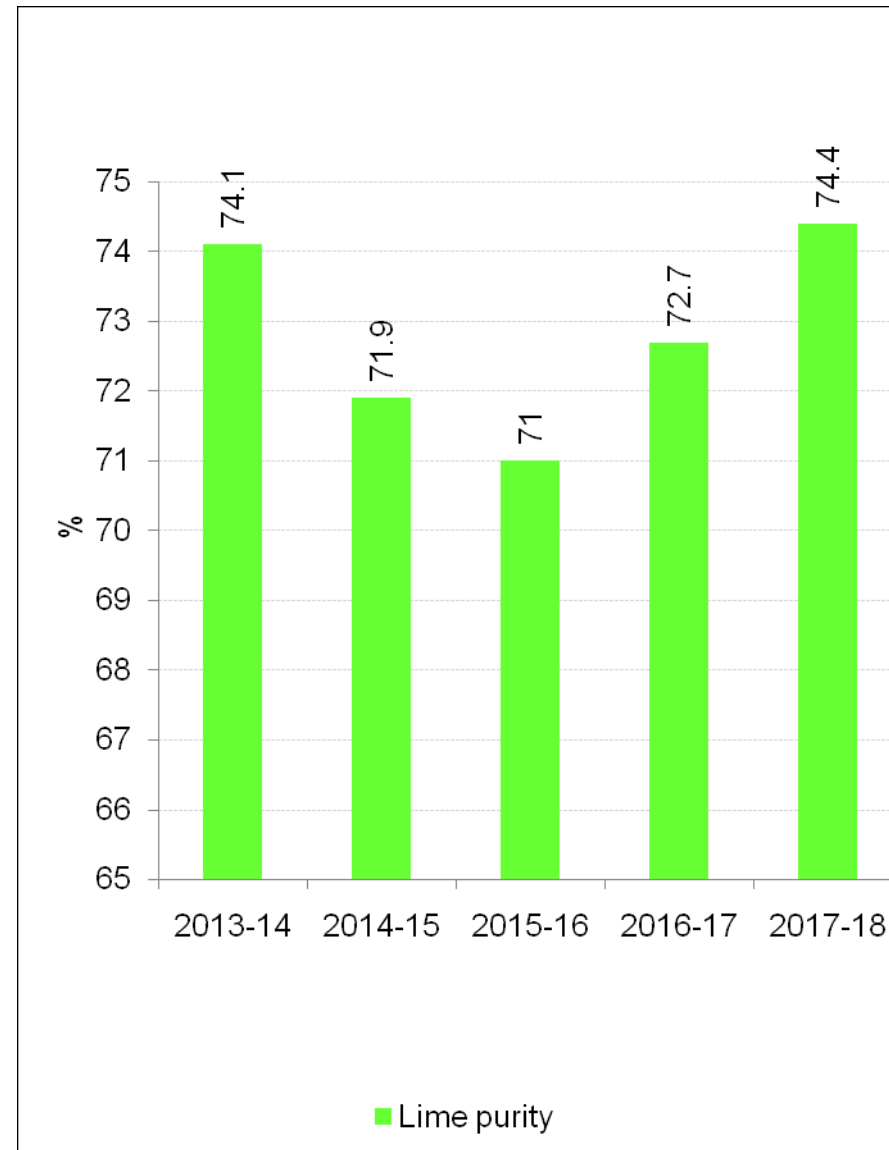


➤ The major advantage achieved by implementing all above innovative ideas is zero furnace oil consumption at Rotary lime kiln and running with Producer Gas Plant and its by product tar , resulting production cost of lime reduced from Rs. 5200.00 to 4800.00 per ton of product lime.

### Furnace oil consumption at Rotary Lime Kiln :



### Lime purity of Rotary Lime Kiln :



## Conclusions:

- **Concentration of firing black liquor increased from 64 - 65% to 70 - 71.0%.**
- **White liquor Sulfidity increased from 18% to 21 - 22%.**
- **To handle higher silica content of lime, two streets causticizing process implemented. Resulting white liquor generation increased from 78 TPD to 110 TPD and increase of dryness of filter cake.**

- **Elimination of use of furnace oil at Lime Kiln and operating 100% with Producer Gas Plant and its by product tar, which has reduced production cost of lime.**
  
- **Purging out lime sludge make up with purchase lime. No limestone is being added at lime kiln.**

**End of Presentation**

# Thank You

