K-PATENTS
PROCESS INSTRUMENTS

BSW Measurement In-line Analysis and Optimization

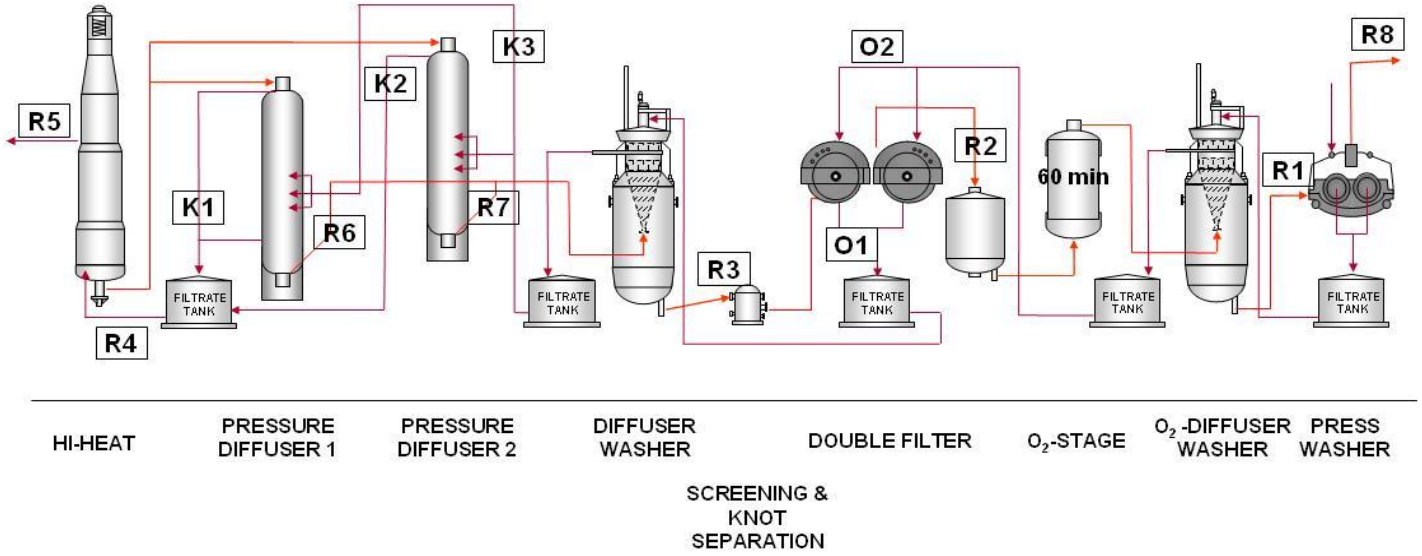
Erkki Kari
K-Patents Oy

K-PATENTS
PROCESS INSTRUMENTS

CONTENTS

1. Background on Optimization Study
2. Optimization Study Results
3. Installation Sites for Refractometers
4. Benefits of In-line Refractometer Measurement

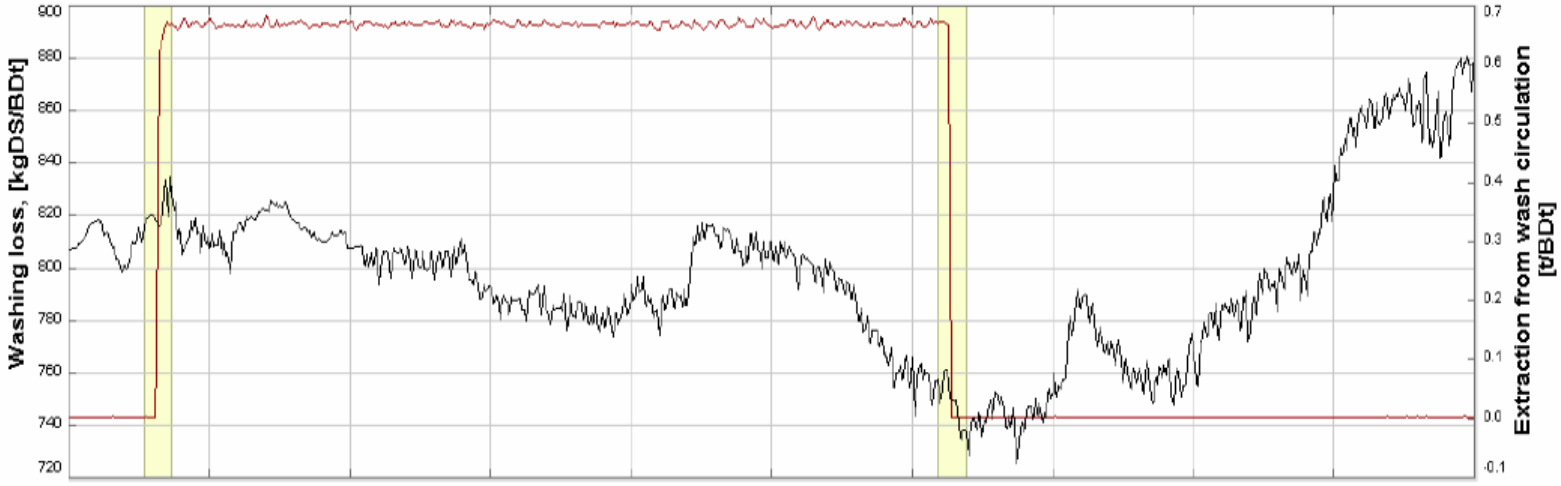
K-PATENTS
PROCESS INSTRUMENTS



- **BSW optimization study was done in 2009/2010 in a Finnish pulp mill**
- **12 refractometers were installed to BSW line to measure total dissolved solids**
- **Sophisticated software tools were used to analyze the washing results**

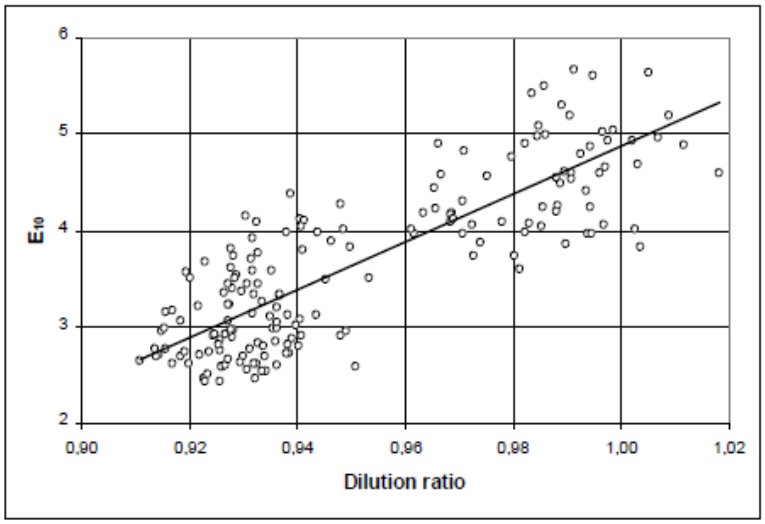
K-PATENTS
PROCESS INSTRUMENTS

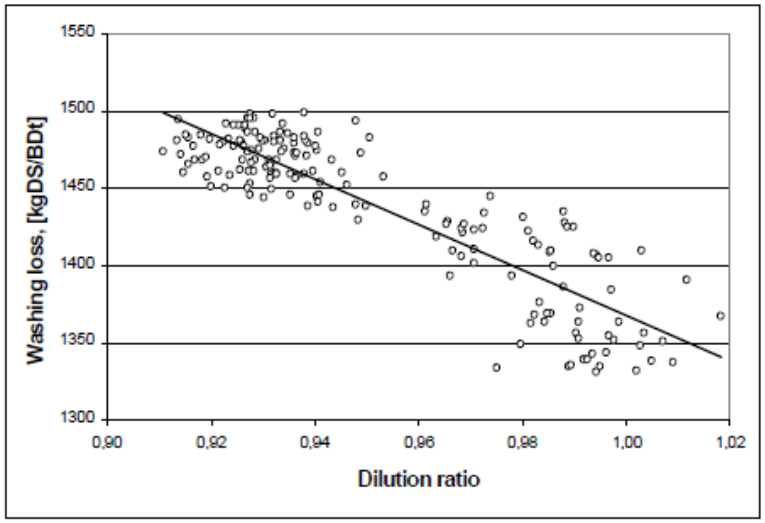
RESULT – DIGESTER WASHING



K-PATENTS
PROCESS INSTRUMENTS

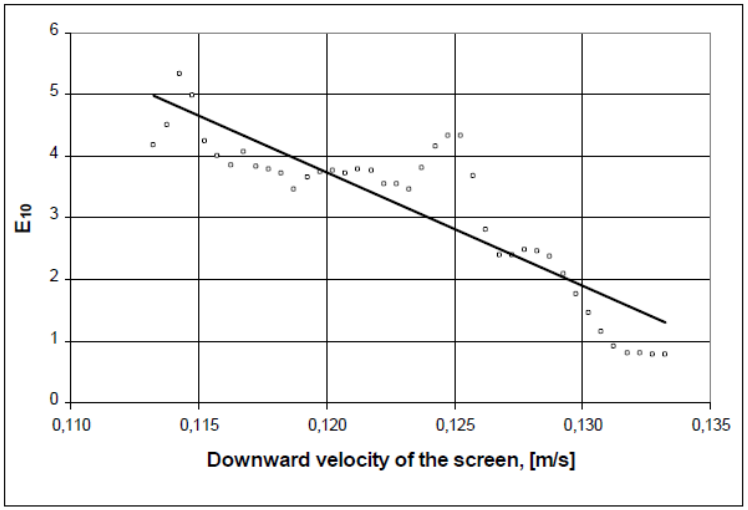
RESULT – PRESSURE DIFFUSER

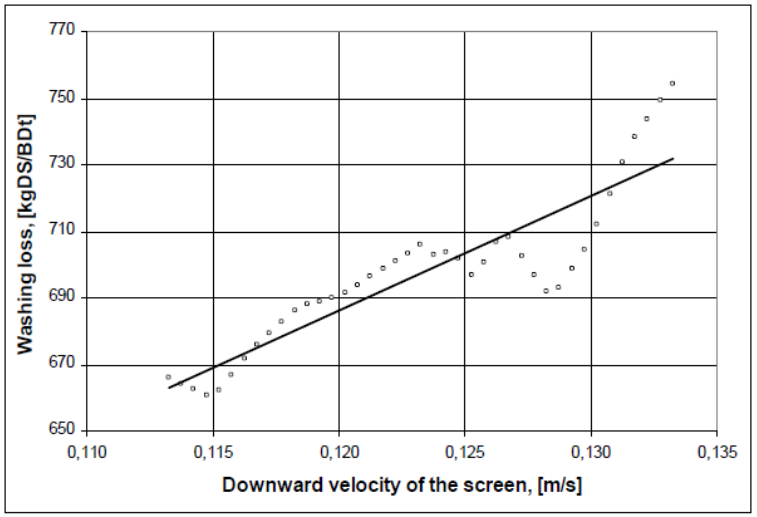




K-PATENTS
PROCESS INSTRUMENTS

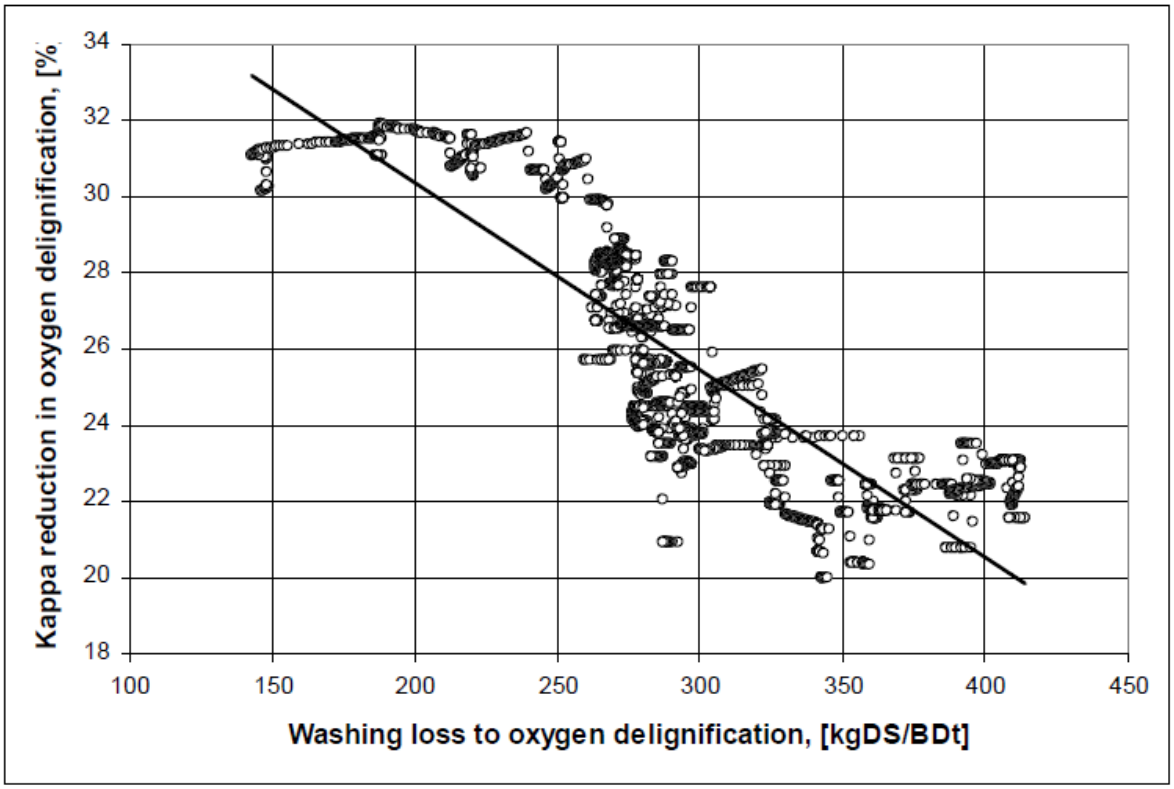
RESULT – PRESSURE DIFFUSER





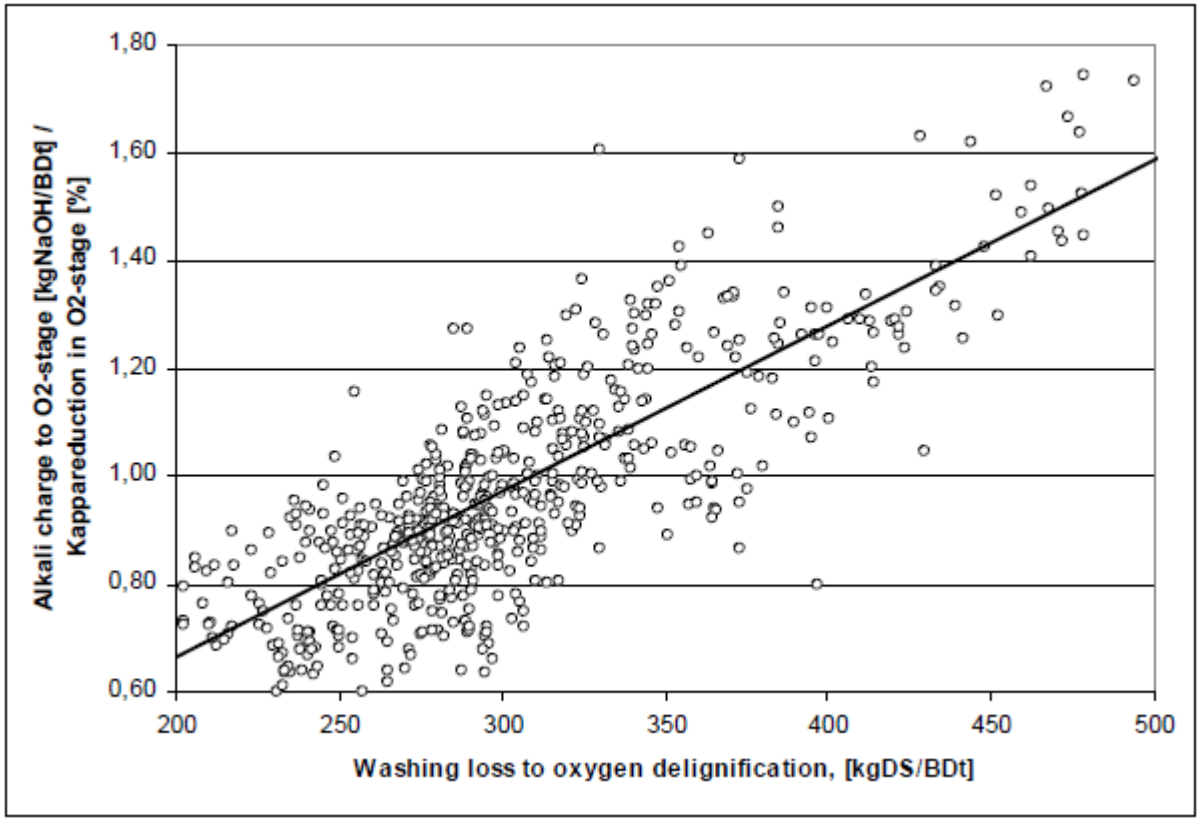
K-PATENTS
PROCESS INSTRUMENTS

RESULT – OXYGEN DELIGNIFICATION



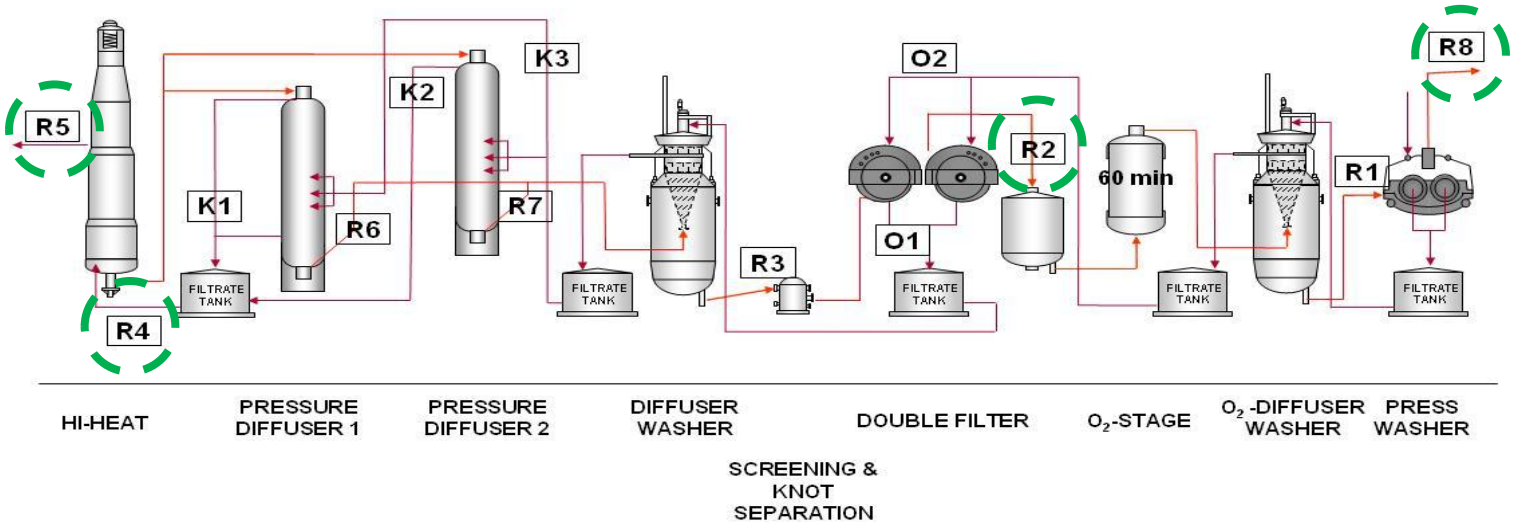
K-PATENTS
PROCESS INSTRUMENTS

RESULT – OXYGEN DELIGNIFICATION



K-PATENTS
PROCESS INSTRUMENTS

INSTALLATION SITES TO OPTIMIZE BSW WASHING EFFICIENCY



INSTALLATION SITES:

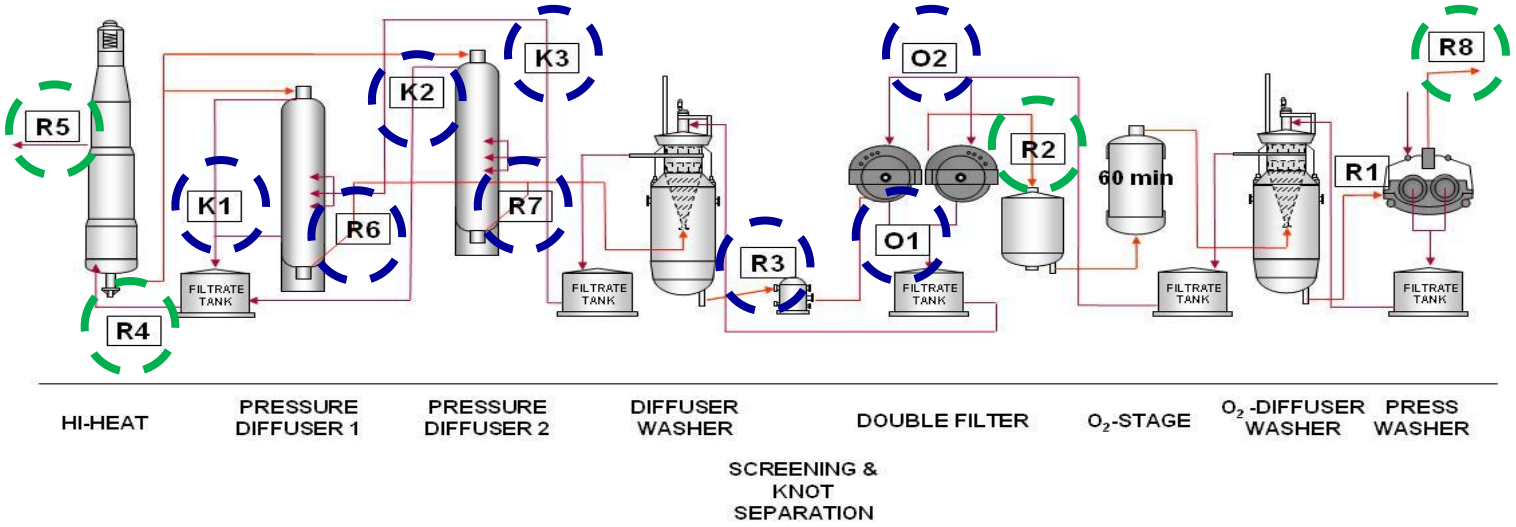
- Black liquor to Evaporation plant
- Digester's blow line
- Pulp to Oxygen delignification
- Pulp to Bleaching plant

GOOD INSTALLATION SPOTS:

- After a pump
- After dilution
- Wash filtrate – Before filtrate tank

K-PATENTS
PROCESS INSTRUMENTS

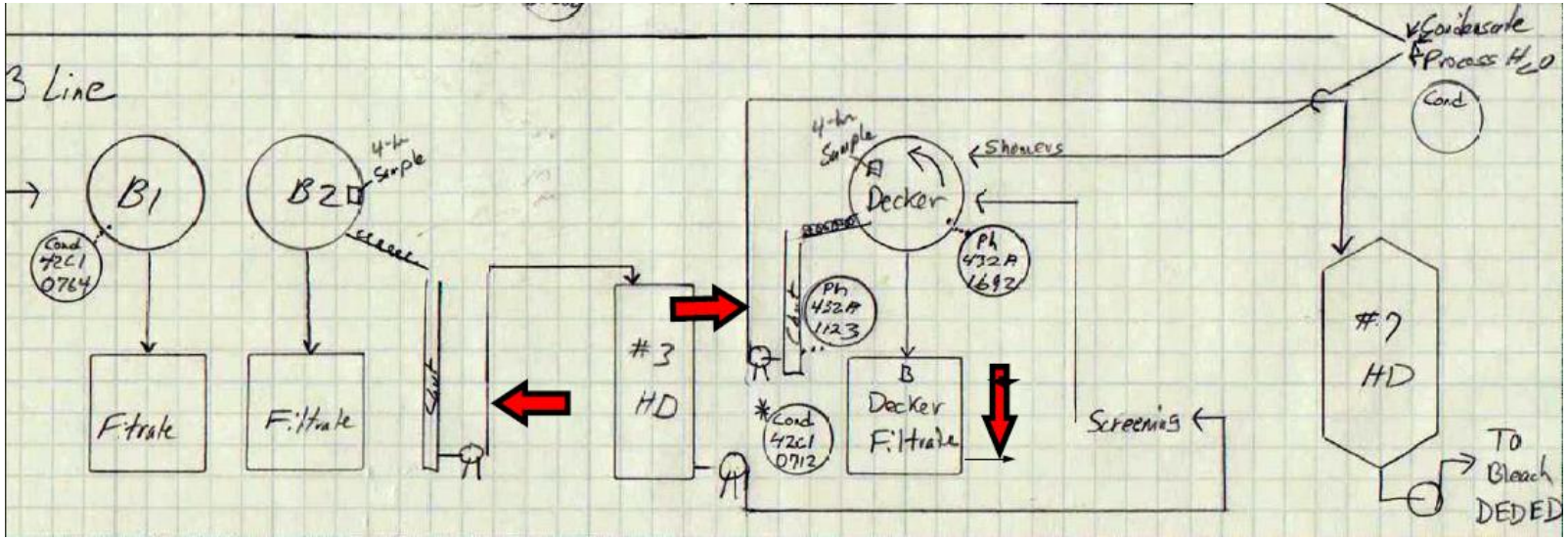
INSTALLATION SITES TO OPTIMIZE DIFFERENT WASHERS



INSTALLATION SITES:

- **Pulp outlet**
- **Wash liquor to washers**
- **Wash filtrate from washers**

K-PATENTS
PROCESS INSTRUMENTS



Production Rate : 660 ADt/d

Wood Species: Mixed western US softwood (mixed pine, douglas fir, white fir)

Installation Sites:

- **Pulp outlet from drum washer to pulp tower**
- **Pulp outlet from decker to pulp tower**
- **Wash filtrate from decker to drum washer**
- **Pulp outlet from digester (will be installed during the next outage, May 2011)**

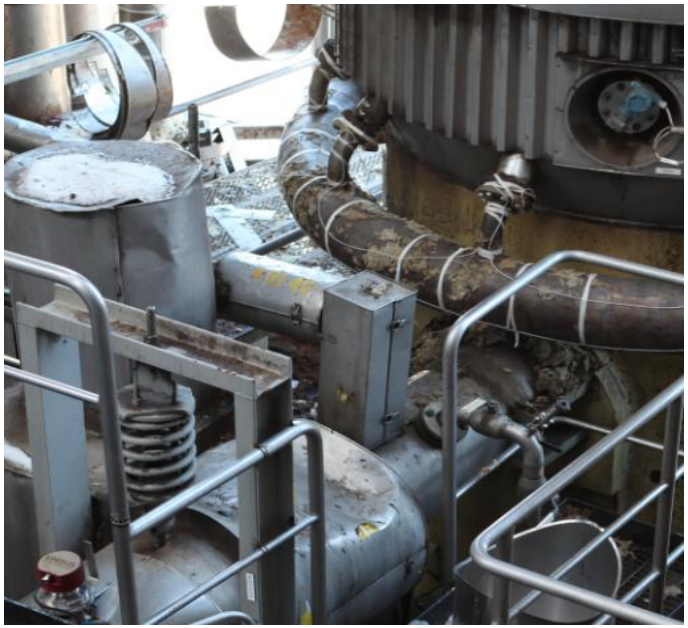
K-PATENTS
PROCESS INSTRUMENTS

2B WASHER
Concentration: 0.6 TDS%
Consistency: 8-11 %
50 kg/BDt

DECKER
Concentration: 0.2 TDS%
Consistency: 8-11 %
20 kg/BDt

K-PATENTS
PROCESS INSTRUMENTS

INSTALLATION EXAMPLES



PULP OUTLET FROM PD

WASH FILTRATE TO DIGESTER

K-PATENTS
PROCESS INSTRUMENTS

BENEFITS OF IN-LINE REFRACTOMETER MEASUREMENT

- REVEALS CONCENTRATION AND PROCESS VARIATIONS
- CONTINUOUS, ACCURATE AND FAST RESPONSE TIME
- TOTAL DISSOLVED SOLIDS ARE MEASURED
- CAN BE USED FOR CONTROLLING
- CAN ALSO BE USED TO MEASURE LIQUOR IN PULP
- PROVIDES NEW POSSIBILITIES FOR IMPLEMENTING HIGHER LEVEL PROCESS OPTIMIZATION FOR BSW
- TOOL TO IMPROVE WASHING EFFICIENCY AND TO REDUCE PRODUCTION COSTS