BRAZILIAN RECOVERY BOILER SAFETY COMMITTEE

June 2015

CSCRB

- Since 1999 (next meeting: ABTCP 49th Pulp and Paper Int. Congress and Exhibition)
- 5 sub committees:
  - Combustion
  - Safety
  - Maintenance (Now dealing with changes on time between inspection - New Brazilian regulation)
  - Water treatment
  - ESP: Afonso Pereira - Ibase / Eduardo Bajo - Lwarcel / Estanislau Zutautas - Veracel / Gilmar Packer - Klabin / Giuliano Penitente - Fibria / Heverton Dias - Suzano / Miguel Paolino - UPM / Virgílio Procópio - Cenibra

ESP Subcommittee

1- Brazil (and Uruguay) recovery boiler database maintenance

2 - Exchange information with other international committees (BLRBAC, SNRBC, FRBC)

3 - Incident analysis

4 - Incident presentation

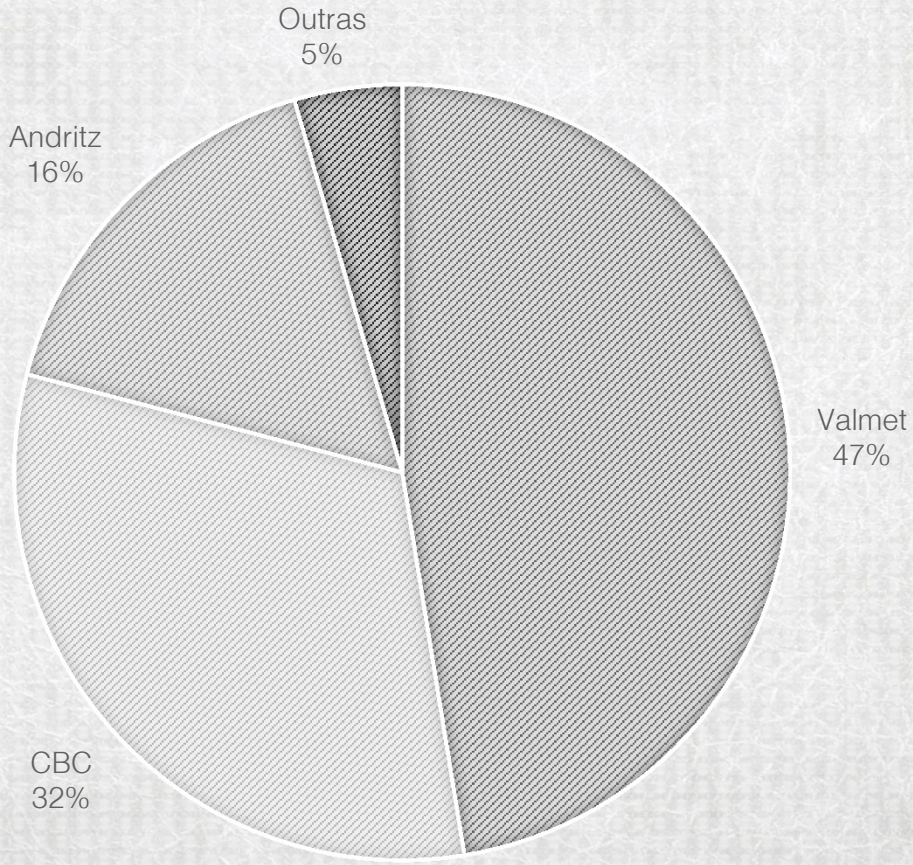
5 - Non ordinary issues

Data base maintenance

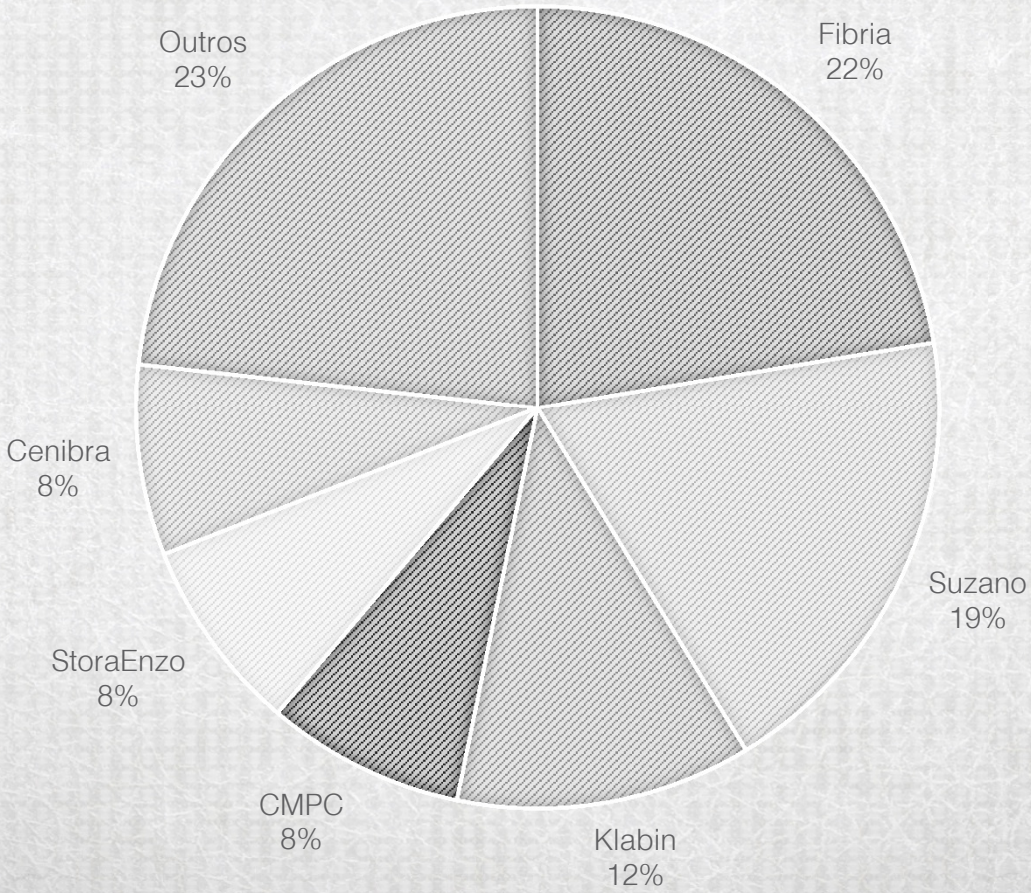
Current status (considering also Uruguay)

- 40 recovery boilers- 38 running, 3 at Uruguay 1 under erection (Klabin Ortigueira) e 1 hibernated (Cenibra)
- 7 Retrofits since 2005
- 11 new boilers since 2005
- Typical age: 20 anos
- Typical size: 2.600 tss/dia
- Not a single boiler under project right now...

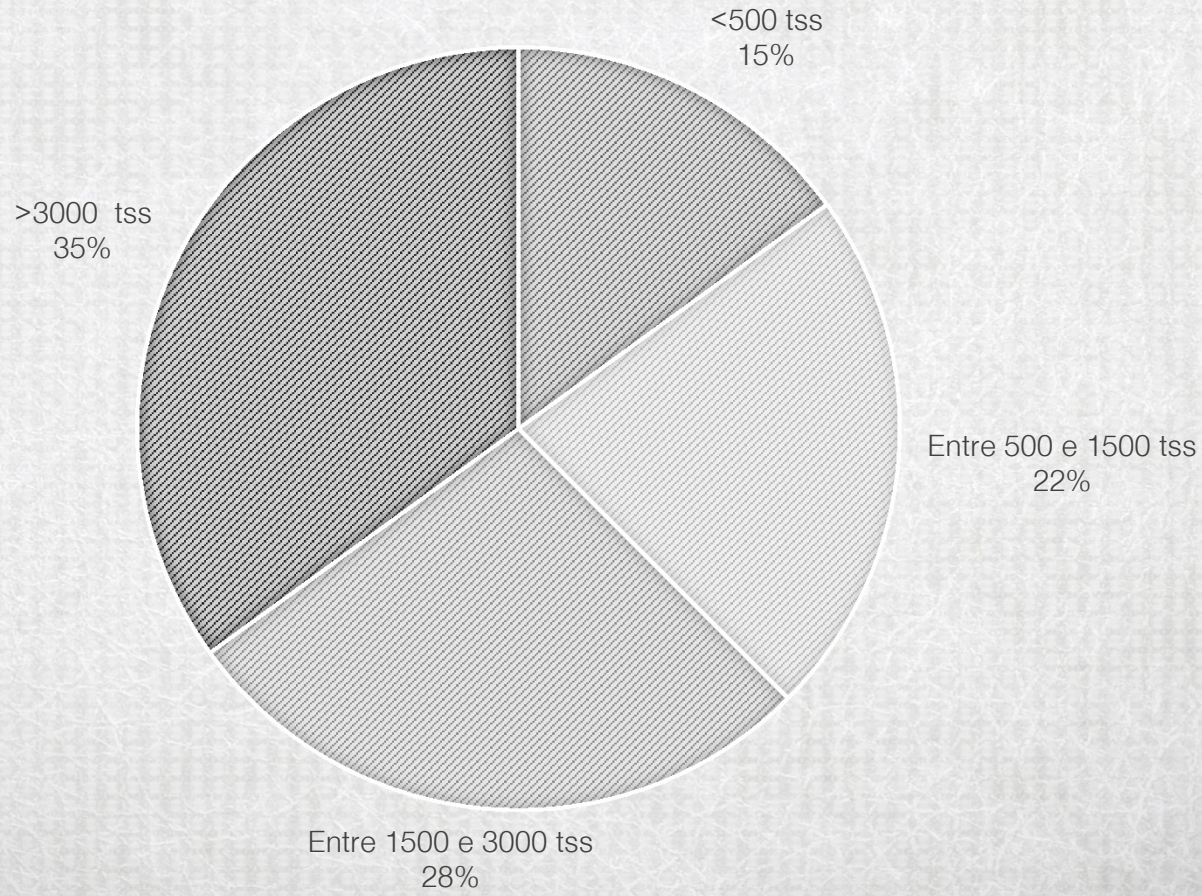
Boilers by suppliers



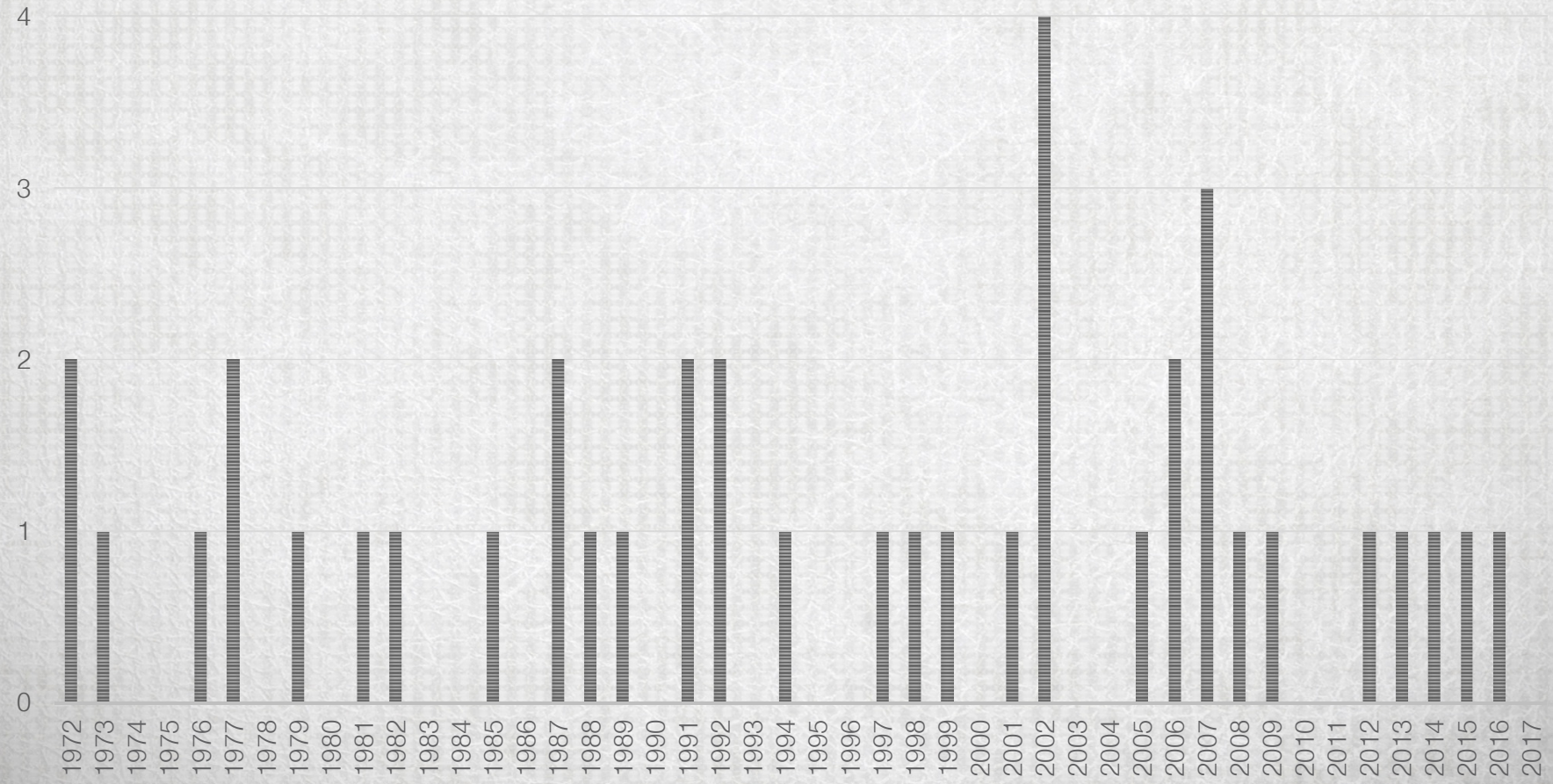
Boilers by end users



Boilers by size



Boilers by start-up year



Data base

#	Company	Supplier	Status	Start up (ano)	Retrofit (ano)	Age (anos)	Capacity Original (tss virgin/d)	Capacity Real (tss virgin/d)	Pressure (barg)	Temp(C)	Steaming rate (t/h)	Area (m2)	Ratio (tss/m2xday)	Boiler responsible
1	BSC	CBC	Running	2008		7	3000	3300	85	490	494	149,2	22,1	Sandro Yosmini <sandro_yosmini@bahiaspeccell.com>
2	CENIBRA	CBC	Hibernating	1977	2003	38	1440	1800	65	450	200	93,86	19,2	Virgílio Procópio <virgilio.procopio@cenibra.com.br>
3	CENIBRA	CBC	Running	1992	2004	23	2050	2700	65	450	422	138,13	19,5	Virgílio Procópio <virgilio.procopio@cenibra.com.br>
4	CENIBRA	CBC	Running	2006		9	3500	3500	66	450	524	189	18,5	Virgílio Procópio <virgilio.procopio@cenibra.com.br>
5	CMPC	B&W	Running	2002		13	2087	2087	64	465	300	125	16,7	Humberto Batista <HLBatista@cmpcrs.com.br>
6	CMPC	Valmet	Running	2015		0	6200	6200	95	490	1075	271	22,9	Humberto Batista <HLBatista@cmpcrs.com.br>
7	COCELPA	Valmet	Running	1988	2010	27	160	270	45	425	30	12	22,5	Aldionir de Liz<aldionir.liz@cocelpa.com.br>
8	Eldorado	Valmet	Running	2012		3	6800	6800	85	485	1116	293	23,2	Murilo Sanches<murilo.sanches@eldoradobrasil.com.br>
9	Fanapel	Valmet	Running	1982	2005	33	138	210	62	410	24	9	23,3	dsalvat@fanapel.com.uy
10	Fibria Aracruz CR-A	Valmet	Running	2001		14	3440	3440	64	450	524	156,7	22,0	Ronaldo Schuster <ronaldo.schuster@fibria.com.br>
11	Fibria Aracruz CR-B	Valmet	Running	1991	2002	24	2200	3600	64	450	524	165,7	21,7	Ronaldo Schuster <ronaldo.schuster@fibria.com.br>
12	Fibria Aracruz CR-C	Andritz	Running	1997	2000	18	2200	3300	64	455	433	130,8	25,2	Ronaldo Schuster <ronaldo.schuster@fibria.com.br>
13	Fibria Jacarei	CBC	Running	1994		21	1430	1990	90	470	240	101	19,7	Julio Cezar Macedo <julio.macedo@fibria.com.br>
14	Fibria Jacarei	CBC	Running	2002		13	2500	2990	93	480	360	149	20,1	Julio Cezar Macedo <julio.macedo@fibria.com.br>
15	Fibria Tres Lagoas	Valmet	Running	2009		6	5300	5500	86	487	822	242	22,7	Fernando Raasch<fernando.pereira@fibria.com.br>
16	Iguacu	São Caetano	Running	1972		43	320	320	12	190	24	18,92	16,9	Wilson Lopes <wilsonlopes@iguacucelulose.com.br>
17	IP - Luiz Antonio	CBC	Running	1991	2005	24	890	1702	64	450	245	66	25,8	Edivaldo Verdile <edivaldo.verdile@ipaperbr.com>
18	IP- Mogi Guaçu	B&W	Running	1976		39	187	320	29	350	28	14,04	22,8	Geraldo Ferreira <Geraldo.Ferreira@ipaperbr.com>
19	IP - Mogi Guaçu	Andritz	Running	1985	2006	30	950	1144	27,6	340	120	51,85	22,1	Geraldo Ferreira <Geraldo.Ferreira@ipaperbr.com>
20	IP -Nova Campina	CBC	Running	2006		9	400	400	42	400	74	26	15,4	Fabio da Costa<fabio.costa1@ipaper.com>
21	Jari Monte Dourado	BHI	Running	1979	1988	36	1360	1750	59	450	276	89	19,7	José Cogui <jcmoreira@jari.com.br>
22	Klabin-Correa Pinto	CBC	Running	1987	1992	28	580	750	85	480	110	49	15,3	Edson Maestri<elbmaestri@klabin.com.br>
23	Klabin Telemaco	Valmet	Running	1977	2000	38	1100	1850	46	430	250	92,5	20,0	Bruno Peres <bhperes@klabin.com.br>
24	Klabin Telemaco	CBC	Running	2007		8	1700	1700	106	503	243	79,6	21,4	Bruno Peres <bhperes@klabin.com.br>
25	Klabin Ortigueira	CBC	Erection	2016		-1	7000	7000	104	503	1200	315,4	22,2	Geraldo Simao <gsimao@klabin.com.br>
26	Klabin-Otacílio Costa	CBC	Running	1998		17	1100	1050	89	483	170	69,1	15,2	Edson Maestri<elbmaestri@klabin.com.br>
27	Lwarcel	CBC	Running	2002	2008	13	700	826	85	480	120	44	18,8	Cesar Anfe <canfe@lwarcel.com.br>
28	Montes del Plata	Andritz	Running	2014		1	5710	5710	97	494	928	289	19,8	Enrique Debera <enrique.debera@montesdelplata.com.uy>
29	Rigesa	Andritz	Running	1999		16	850	600	64	460	126	47,4	12,7	Fernando Wessler <fernando.wessler@mwv.com>
30	Suzano Imperatriz	Valmet	Running	2013		2	7000	7000	95	492	1207	323,2	21,7	Ageu Oliveira da Silva Júnior<ageus@suzano.com.br>
31	Suzano Limeira	Valmet	Running	1972		43	270	510	42	380	65	24,11	21,2	Antonio Carlos Andrella<acarlosandrella@suzano.com.br>
32	Suzano Limeira	Valmet	Running	1981	2000	34	270	510	42	380	65	24,11	21,2	Antonio Carlos Andrella<acarlosandrella@suzano.com.br>
33	Suzano Limeira	CBC	Running	2002	2007	13	1100	1700	46	400	180	69	24,6	Antonio Carlos Andrella<acarlosandrella@suzano.com.br>
34	Suzano Mucurí	Valmet	Running	1992	2007	23	1750	3000	85	480	420	144	20,8	Hildomar Raimondi <hildomar.raimondi@suzano.com.br>
35	Suzano Mucurí	Valmet	Running	2007		8	4700	4700	85	480	738	251	18,7	Hildomar Raimondi <hildomar.raimondi@suzano.com.br>
36	Suzano Suzano	Valmet	Running	1973	2004	42	670	811	50	380	110	49	16,6	Heverton Dias<hevertondias@suzano.com.br>
37	Suzano Suzano	CBC	Running	1987	2002	28	800	1400	50	420	218	64,1	21,8	Heverton Dias<hevertondias@suzano.com.br>
38	Trombini	Orcepa	Running	1989	2000	26	140	180	21	420	30	10	18,0	Alceu Scramocin <AScramocin@fbo.trombini.com.br>
39	UPM	Andritz	Running	2007		8	4900	6300	94	490	780	210	30,0	carolina.pesce@upm.com
40	Veracel Celulose	Valmet	Running	2005	2011	10	4000	4800	93,6	490	630	210	22,9	Estanislau Zutautas<estanislau.zutautas@veracel.com.br>
*	Mean	N/P	N/P	N/P	N/P	19,7	2272,3	2593,0	67,7	443,3	386,1	121,4	20,6	N/P

Comparisons

	Br/Uy	Canada	USA	Finland	Sweden
Recovery boilers	40	43	153	17	27
Age	20 y	39 y	38 y	27 y	32 y
Oldest	43 y	77 y	63 y	58 y	55 y
Biggest	7000 tDS/d	3300 tDS/d	3325 tDS/d	7200 tDS/d	4000 tDS/d
Youngest	2016	2007	2016	2017	2012

Highlights

Company	Capacity (tss/d)	Pressure (barg)	Temp (C)	Area (m2)	Ratio (tss/m2.d)
IP-LA	1700	64	450	66	25,8
Suzano Imperatriz	7000	95	492	323,2	21,7
Klabin TB	1700	106	503	79,6	21,4

Trends

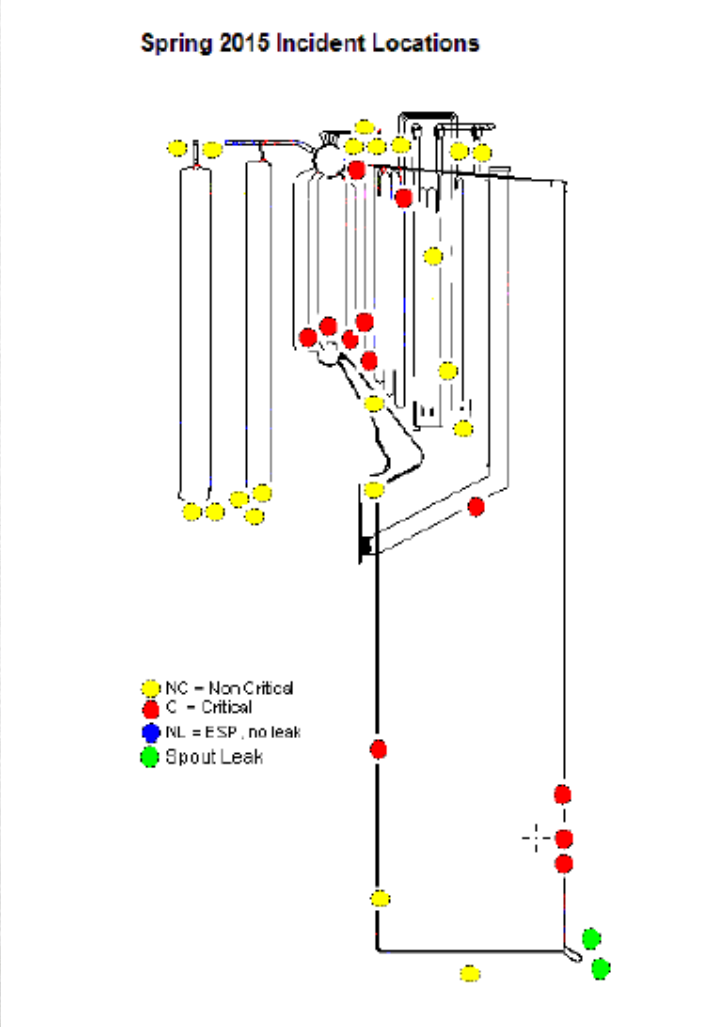
- Higher temperatures and pressure(110 barg @ 515C)
- Higher steaming rates(4,3 steam tons/tss)
- Bigger(APP-OKI Paper 11.600/12.760 tss/d em 2016)
- Flue gas energy recovery
- When are we going to burn solid black liquor?

Exchanged information

BLRBAC

- Two meetings per year (224 participants on 2015/1)
- 10 subcommittees
- 30 events reported on 2015/1
- All information is open and easily found: www.blrbac.org
- April 2015 Meeting Minutes

BLRBAC


Spring 2015 Incident Locations
NC = Non Critical
C = Critical
NL = ESP, no leak
Spout Leak

BLRBAC

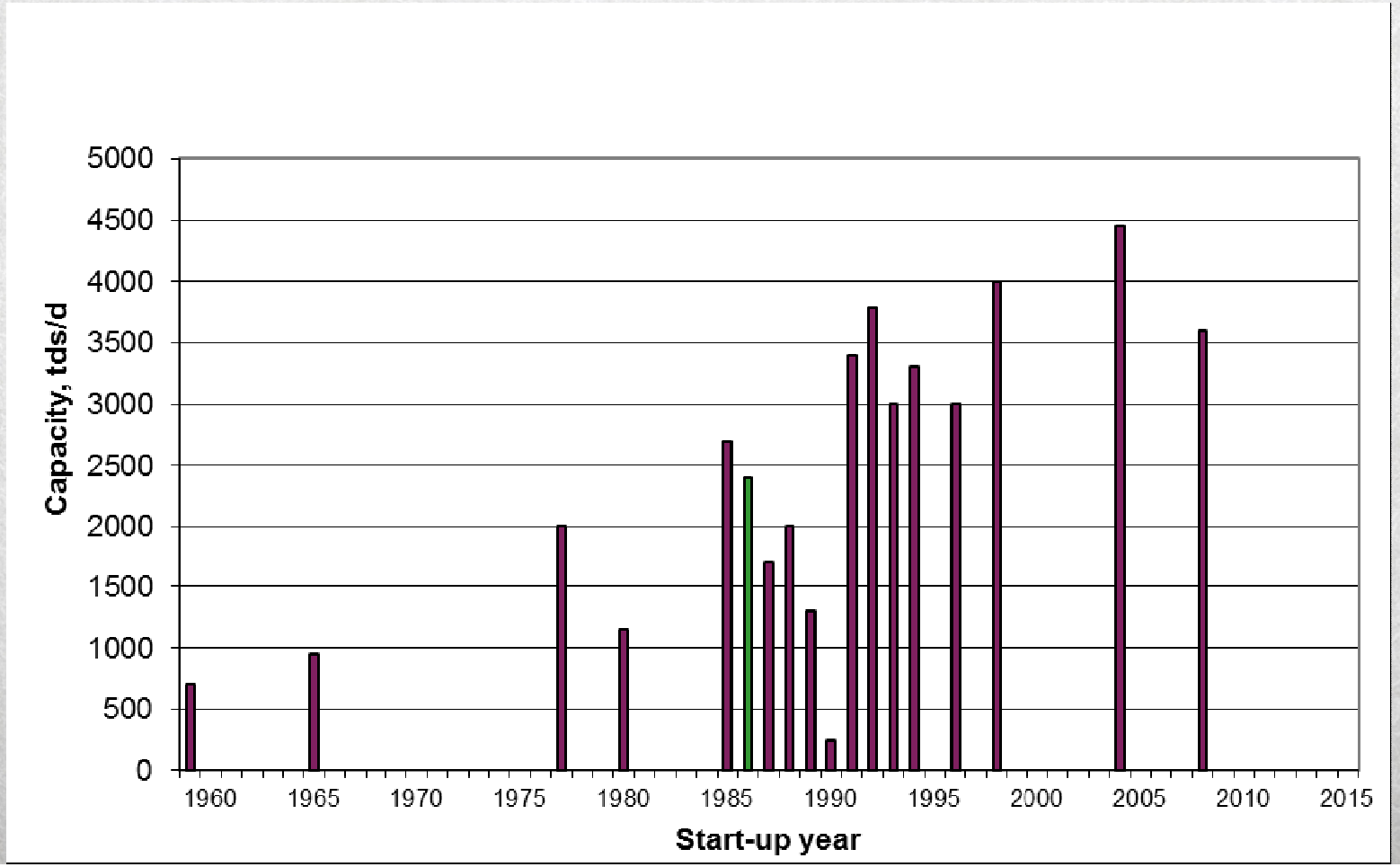
LOWER FURNACE

SPRING 2015 – 23	
Classification:	
Location:	**International Paper, Bogalusa, LA**
Unit:	RB20, PR-66 (rebuilt as PR-202 in 1980), 1964, B&W, two cyclone DCE, front-slope floor
Unit Size:	2.8 MM lb ds/day; 388,000 lb/hr steam at 852 psig, 825°F, 1050 psig design
Incident Date:	August 4, 2014
Downtime hrs, leak/total	101hrs 3 minutes – Liquor to Liquor
ESP?	**No**
Leak/Incident Loc:	Leak #1 – Cold Side Tube #73 Front Wall Leak #2 – Hot Side Tube #10 Rear Wall
How discovered:	Operator Walk down
Wash adjacent tube:	No
Root cause:	Failures of both tubes were in heat affected zones on the hot side of the tubes. Cracks initiated primarily at the outer diameter surface of the tubes and propagated through the wall in a method similar to thermal fatigue.
Leak detection:	No
Bed cooling enhanc	No
Last full inspection:	April 2014
Sequence of events:	20 RB was operating normally after a trip 2 days earlier due to a PLC card failure. The field operator was cleaning the spouts and primary airports when he noticed steam vapor coming out of an obsolete secondary cleaning port. Further inspection of the air ducts indicated that water was not entering the boiler through the primary or secondary air ducts. No alarms were indicated on the duct leak detection system. The Recovery Area Manager was called to inform him of the situation at which time he confirmed that the secondary airports on the front wall had been removed and replaced with fully welded straight tube sections. The original feeder ducts to the obsolete port from the secondary ductwork were still installed and that there should not be any water entering the furnace. The Recovery Area Manager went to the plant and completed a second inspection of the primary and secondary ductwork and no water could be seen in either the primary or secondary ductwork. The boiler was put on auxiliary fuel/ taken off liquor and a third inspection of the ductwork was completed. Once off liquor the inside of the furnace was inspected from the gun ports and no water could be seen. There were still no leak detection alarms present. The bed was burned out and the boiler was shutdown in an orderly fashion. Once cooled down the Boiler was water washed as the leak was suspected to be at the attachment weld for the obsolete feeder duct which would require a Dutchmen be installed. The leak was identified on Tube #73 on the front wall – cold side inside the sealed feeder box to the obsolete secondary airport. An 18" long Dutchman was installed. On the Hydro test, August 6th at 9:42am, a second leak on tube #10 on the rear wall – hot side was found. Once scaffold was installed it appeared to be a leak at a location a pin stud was removed to install a Dutchmen below this location. This tube was cut out and a 24" Dutchmen was installed. A dry hydro was achieved on August 7th and 2:46am. The inside scaffolds were removed, the boiler was unlocked and put back in service.
Repair procedure:	Replaced tube with Dutchmen
Future prevention:	Plan a complete Lower Furnace replacement in April 2015

FRBC

- The Finnish Recovery Boiler Committee (FRBC) has promoted safe, economic and environmentally friendly operation of recovery boilers and closely related processes since 1964.
- The Committee collects information about incidents involving recovery boilers and provides details of these to its members. The Committee publishes guidelines, recommends practices and arranges conferences and meetings. The Committee conducts and supports research projects related to safe operation and improved economy of recovery boilers.
- Guidelines for NCG incineration

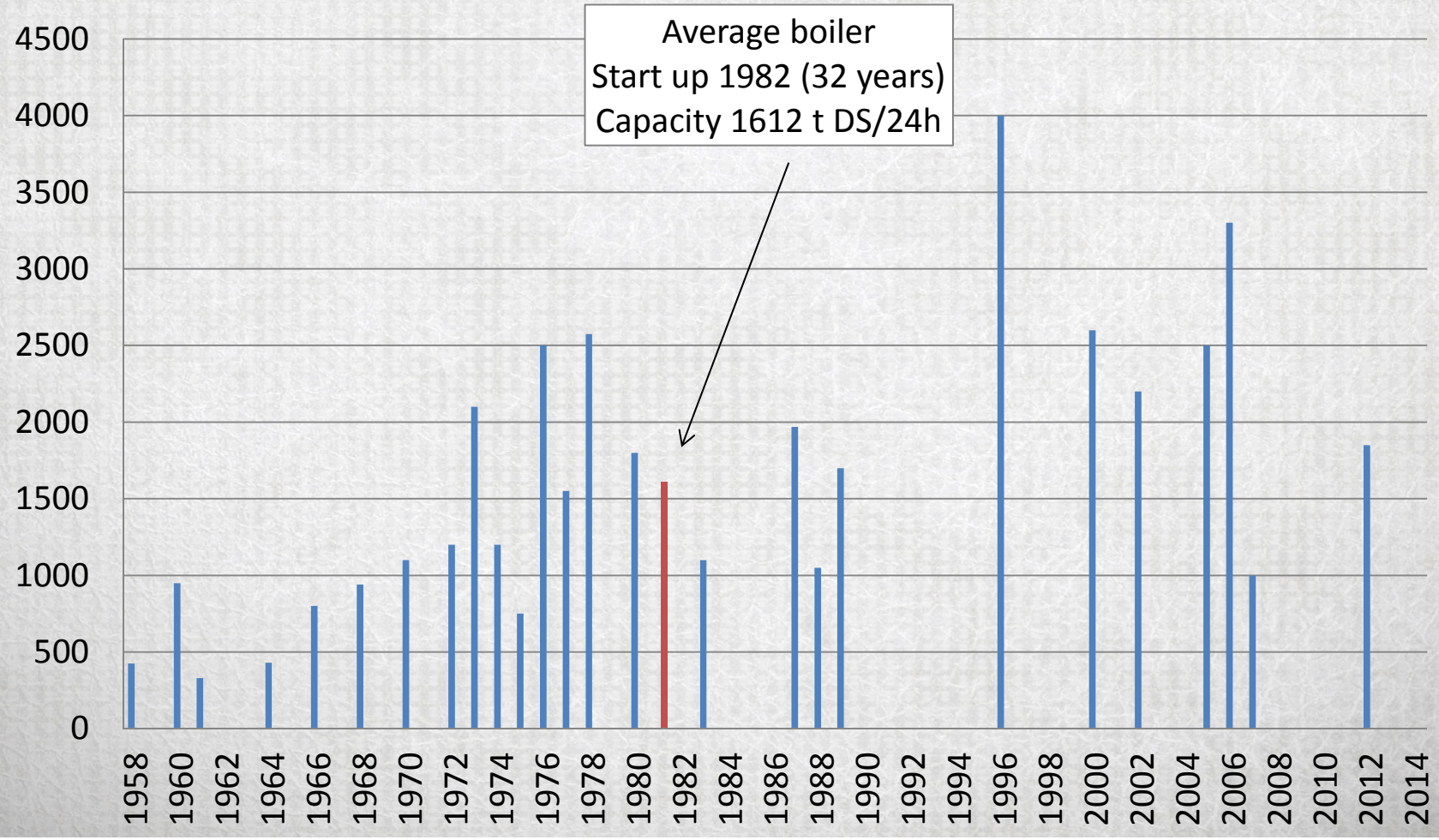
FRBC


Capacity, tds/d
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Start-up year

SNRBC

- 19 members
- 4 subcommittees:
- Typical boiler: 32 years old and 1612 tss/day
- One event/boiler/year
- 40 recommendations issued
- Working in operators certification

SNRBC


Average boiler
Start up 1982 (32 years)
Capacity 1612 t DS/24h
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014

Incident analysis

Classification

- **Critical**
- **Not critical**
- **Dissolving tank explosion**
- **Accident: When people or the recovery boiler itself were under risk, independent of leakages consideration – examples: HBL Tank failure; BFW contamination…**

Recovery boiler safety

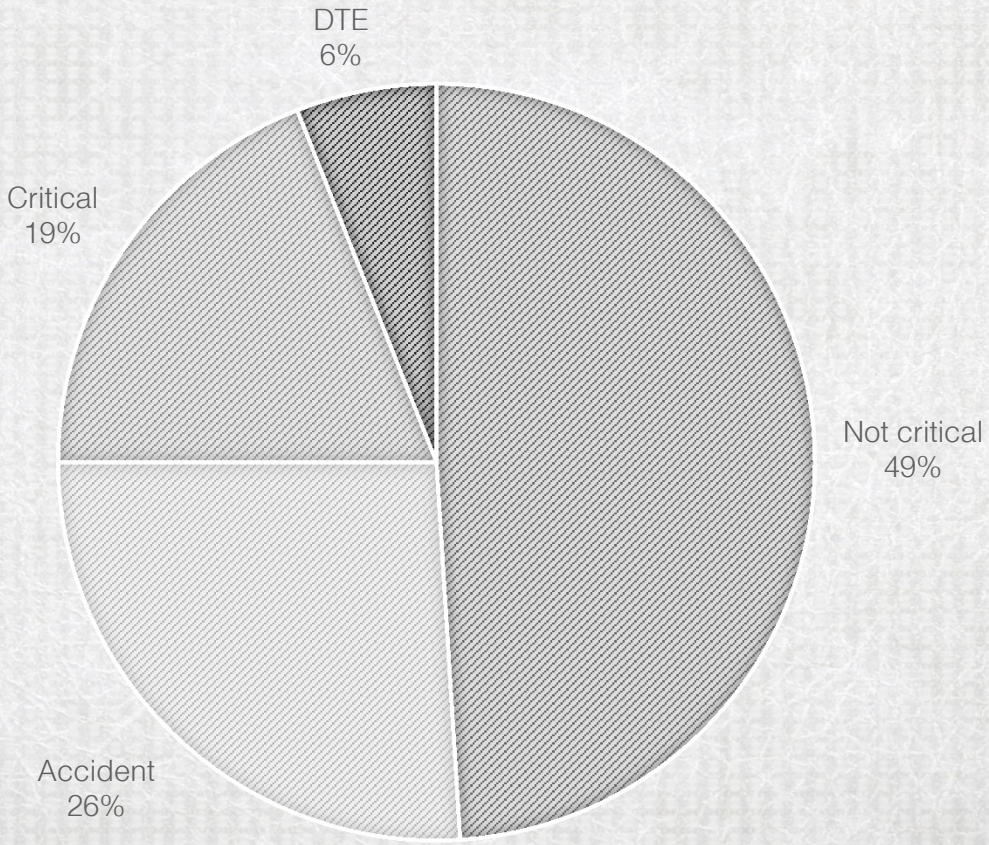
- Project
- Instalation
- Operation
- Maintenance
- Continuous improvement

Zero accident

Recovery boiler safety

- Event: An essential tool for continuous improvement. It must be disclosed, studied so that recommendations will be created after each single event

Event type



Base de dados – 122 eventos

Event remarks

- Decreased Dissolving Tank events after deep procedure discussions (2006)
- Since 2001 we have only one injured person (DTE) on recovery boiler related events
- One minor explosion due waterwashing a hotter furnace
- Three smelt-water contacts without explosion
- 0 ESP's from 2002 to 2007
- 11 ESP's since 2008 (all but one, correctly evaluated by operators)

Where are our events?

- Sweden reports on average one event per boiler per year
- The Brazil reports on average 0.2 event per boiler per year
- What is the conclusion? We do not report our events
- Why do we not report these events?
- Likely responses:
  - Lack of time?
  - Lack of responsibility assigned to such activity?
  - Company policy?
  - None of these options?

Events presentation

Cases

No events presentation, find bellow 2014/2015 events summary

2014 Event List								
Company	Seq	Name	Date	Report	Presented	Downtime	Class	Event
Fibria TL	113	CR1	02/01/14	Yes	Yes	NA	NC	Personal accident around smelt spout
CMPC	114	CR1	02/01/14	Yes	Yes	39	NC	smelt run off
Veracel	115	RB1	22/01/14	Yes	No	88	NC	SH failure
Suzano MC	116	RB1	26/05/15	No	No	139	NC	SH failure
Suzano MC	117	RB1	05/06/15	No	No	53	NC	Eco failure
BSC	118	RB1	14/07/14	No	No	NA	NC	SH failure
Cenibra	119	RB2	04/10/14	Yes	No	143	NC	False lower furnace leakage (w/ESP)

Cases

No events presentation, find bellow 2014/2015 events summary

2015 Event List								
Company	Seq	Name	Date	Report	Presented	Downtime	Class	Event
Suzano LM	120	CRC	28/01/15	No	No	20	NC	Eco II failure
Suzano LM	121	CRB	14/02/15	No	No		NC	Eco failure
Suzano MC	122	EV1	08/05/15	No	No	No	A	NCG explosion at evaporation line 1

Non ordinary issues

Data base maintenance

- Delayed. Considering 40 boilers, we still have 19 questionnaires unanswered
- Results will be presented when all the boilers have been updated

Major concerns

- **Superheater life cycle (film)**
- **Materials for lower furnace tubes (paper)**
- **Guidelines for x-large boilers**
- **Cooling time for x-large boilers (7 days were required to cool a particular boiler before inspection/ after ESP)**
- **15 month campaign (new standard) between inspections**

Thanks