



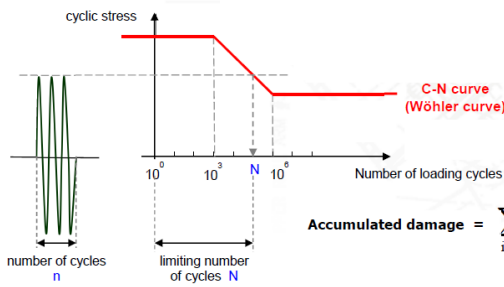
# Optimization of the Length of Backup Rolls Campaign

- **Roll Supervisor** – software module for on-line monitoring of residual fatigue life of backup rolls and prediction of a depth of dressing.

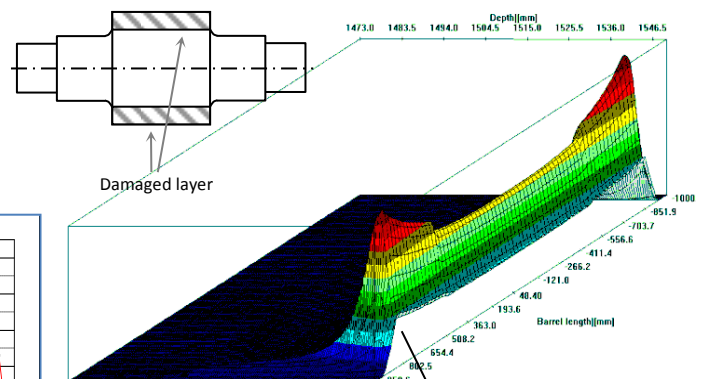
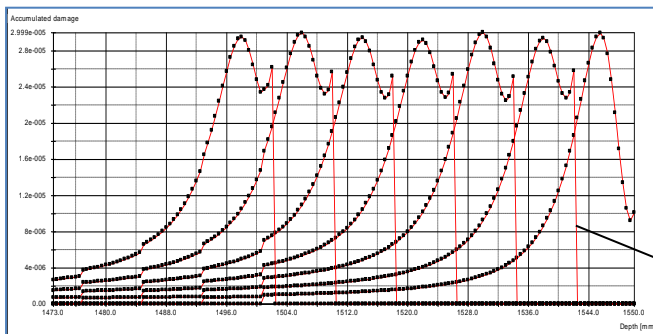
History of real proces loading of the Backup roll being saved continuously by the proces control system

Hertz contact load  
Bending load  
Residual stress

Resultant cyclic stress



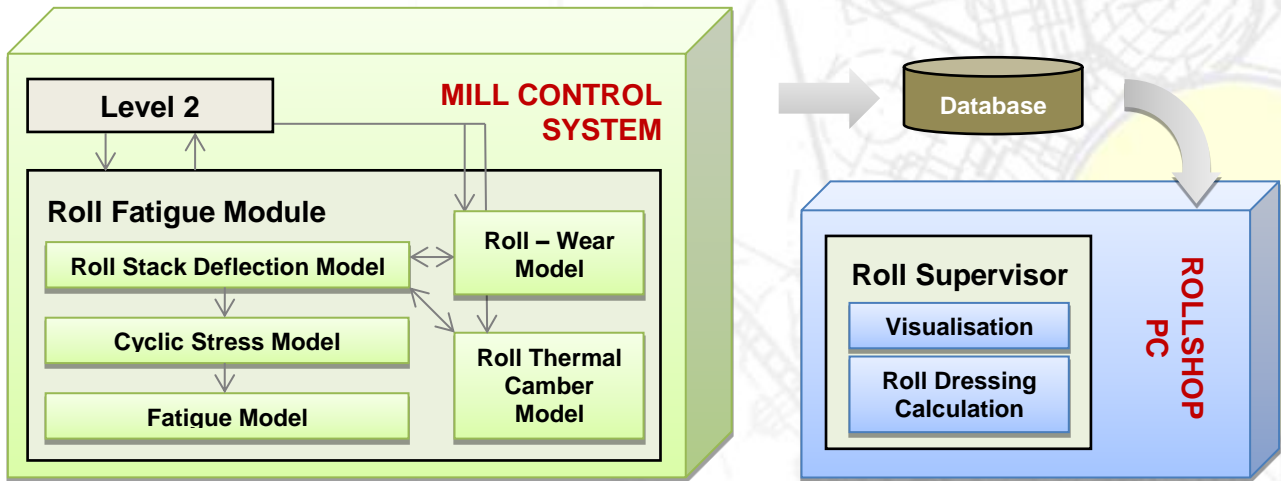
$$\text{Accumulated damage} = \sum_{i=1}^k \frac{n_i}{N_i}$$



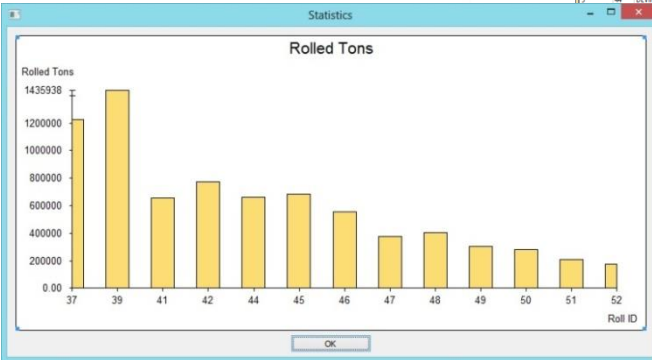
Predicted accumulated fatigue damage considering removal of dressing amount

Predicted accumulated damage along the barrel length

*Basic scheme of the Roll Supervisor*

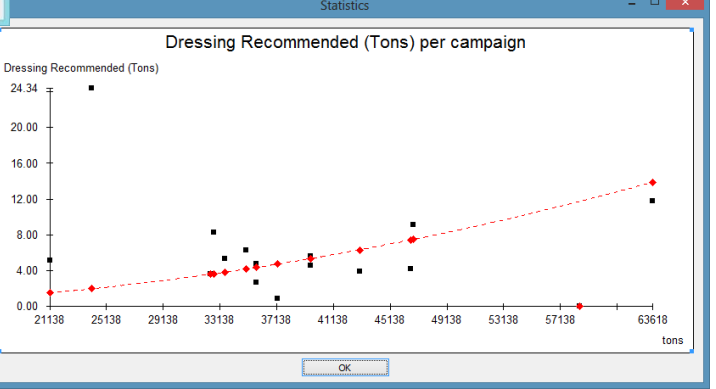


*Overview of the Roll Supervisor with displayed tons rolled by each roll*



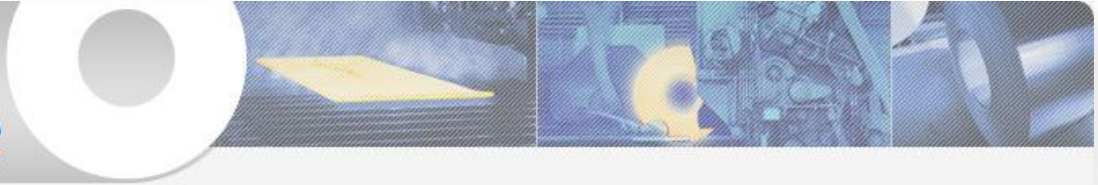
Index	Roll ID	Producer	Cr %	Exploitation from	Diameter (mm)	Status	Expected Campaigns	Expected Tonnage	Campaigns	Rolled Tons	Item	km	km/mm	Price (Kc)	act	kc/km	mm/kt	mm to scrub diameter
1	37	NIMAZ	2.90	2007-03-27 00:00	1611.79	UT 23, stn...3	120000.0	31	122166	9328	72158	562.8	5987729.3	3.3	55.0	0.4198	11.79	
2	39	NIMAZ	2.75	2007-06-09 00:00	1617.28	UT 100, stn...4	160000.0	38	143391	11700	89356	696.0	4319200.3	3.1	52.0	0.3419	17.28	
3	41	NIMAZ	2.71	2008-08-17 00:00	1654.83	UT 23, stn...15	600000.0	32	655989	8172	39223	438.9	5334817.1	3.1	135.0	0.5173	54.53	
4	42	NIMAZ	2.73	2008-10-02 00:00	1643.80	UT 100, stn...12	400000.0	24	370288.7	8007	48994	305.1	6066946.7	9	124.0	0.4996	43.80	
5	44	DEVIMEX	3.20	2009-01-06 00:00	1666.93	UT 23, stn...18	700000.0	24	610793	9029	42243	578.1	3588000.5	4	84.0	0.4430	66.93	
X	513			2009-02-08 00:00	1671.06	UT 23, stn...19	760000.0	21	662794.5	9504	40241	588.1	3588000.5	3	88.0	0.4039	71.06	
X	270			2009-04-01 00:00	1640.03	UT 45, stn...11	440000.0	17	516784.4	5469	23867	338.8	3584000.1	10.0	165.0	0.7183	40.03	
X	317			2010-08-10 00:00	1707.29	UT 23, stn...29	379000.0	14	379000.0	1189	24115	737.2	3662000.9	7	153.0	0.3461	107.29	
X	317			2010-08-10 00:00	1704.15	UT 23, stn...28	1120000.0	13	4041814	11274	26931	751.2	3662000.9	1	137.0	0.3548	104.15	
X	280			2011-04-02 00:00	1700.61	UT 75, stn...27	1800000.0	9	3807359	7722	19164	484.1	4787300.1	18.7	248.0	0.5180	100.61	
X	280			2011-06-25 00:00	1721.71	UT 23, stn...33	1320000.0	9	3817583	15404	17985	966.9	4787300.1	17.0	275.0	0.2397	121.71	
X	315			2012-01-23 00:00	1704.08	UT 23, stn...34	1360000.0	8	2114883.1	13283	14143	888.4	3588000.1	17.0	255.0	0.3011	124.08	
X	326			2012-02-17 00:00	1715.58	UT 23, stn...32	1280000.0	6	1792543	7176	10433	427.2	3588000.2	20.5	343.0	0.5574	115.58	

Campaign	Stand	Campaign Start	Tons	Process	Kms	Process	Barrel Diameter (mm)	Dressing (mm)	Rolled thickness 1.5-2.0 mm	Rolled thickness 2.1-3.0 mm	Rolled thickness 3.1-13.9 mm	Contact	Contact	Middle Force
1	1H	2008-11-...	58467	58467.9	3216	3216.6	1739.25	0.00	6.8	64.7	26.0	806732.06	0.00	0.00
2	2H	2009-02-...	42997	101435.3	2732	5946.7	1735.38	0.00	11.3	58.9	29.2	659954.00	0.00	0.00
3	1S	2009-06-...	21327	122573.1	1391	7248.1	1730.25	0.00	6.7	62.1	27.5	311233.00	0.00	0.00
4	2H	2009-09-...	37212	159785.8	2727	9967.9	1729.33	0.92	24.1	55.3	20.1	604043.00	0.00	0.00
5	1H	2009-10-...	46760	206546.4	2435	12403.8	1720.21	0.00	6.4	51.6	41.9	667772.03	0.00	0.00
6	2H	2010-01-...	35001	341547.5	2303	14707.2	1713.92	0.00	14.9	54.9	28.3	558513.00	0.00	0.00
7	1H	2010-03-...	39502	281050.4	2411	17119.0	1708.27	0.00	10.9	58.3	30.2	604584.01	0.00	0.00
8	1H	2010-04-...	46592	327643.3	2718	19837.1	1704.02	0.00	7.4	60.9	30.3	693987.00	0.00	0.00
9	1H	2010-09-...	63617	391261.1	3627	23464.3	1692.21	0.00	10.2	57.3	31.0	515600.09	0.00	0.00
10	2H	2010-11-...	35681	426942.9	2080	25544.8	1687.43	0.00	10.2	57.3	31.0	515600.09	0.00	0.00
11	2H	2011-01-...	32438	494401.2	1984	27329.8	1685.78	0.00	12.1	58.9	27.7	476413.05	0.00	0.00
12	2S	2011-04-...	32718	482195.7	1838	26367.3	1675.47	0.00	0.0	0.0	0.0	0.00	0.00	0.00
13	2H	2011-06-...	35691	527811.5	2119	31486.8	1672.75	2.32	0.0	0.0	0.0	0.00	0.00	0.00
14	2H	2011-09-...	33513	561324.9	1840	33327.6	1667.40	0.00	9.4	55.0	30.5	466668.06	0.00	0.00
15	2S	2011-12-...	39549	600874.7	2379	33706.9	1662.78	0.00	10.6	63.4	22.2	370660.01	0.00	0.00
16	1H	2013-03-...	24096	624971.4	1277	36984.3	1638.44	0.00	5.8	65.2	27.8	342985.01	0.00	0.00



*Selected roll details and prediction of recommended dressing / grinding amount*

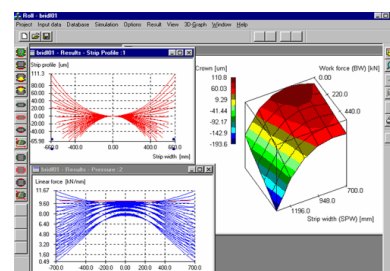
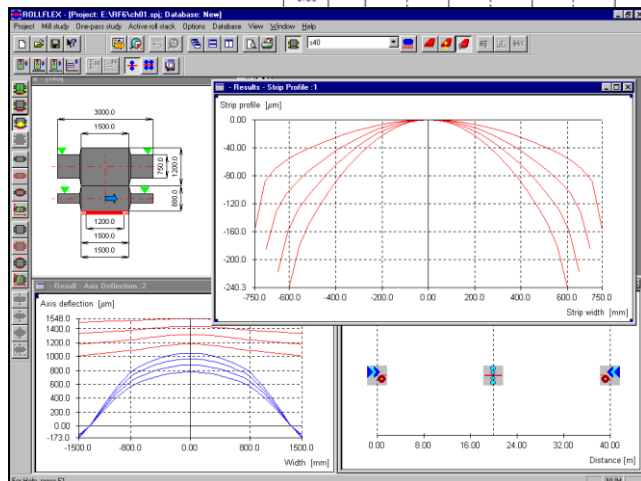
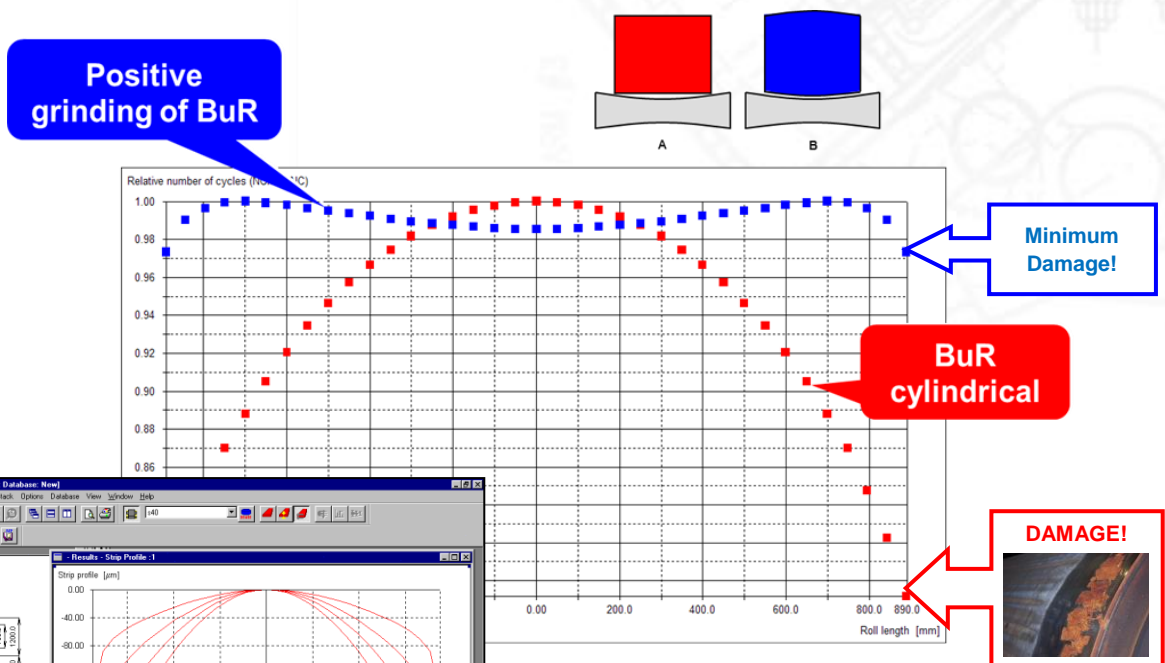




**The Roll Supervisor Benefits:**

- Optimization of the length of the backup roll campaign**  
Monitoring of damage accumulated in the surface layer of backup roll can prolong its campaign. Expensive back up rolls can be exploited longer than scheduled. Sometimes the campaign can be shortened to avoid unexpected total damage of rolls when they are overloaded.
- Controlled backup roll grinding**  
Estimation of the up to date depth of damaged layer enables to grind away only the necessary layer so the backup roll process life can be prolonged!

**RollFlex – off-line roll stack deflection analysis coupled with the module for prediction of fatigue damage of backup rolls.**



Off-line analysis of the influence of grinding on residual life of the backup roll