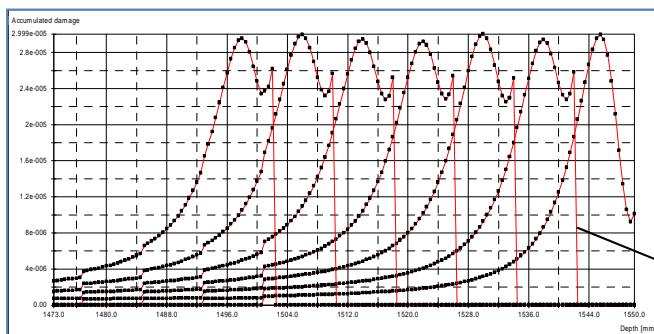
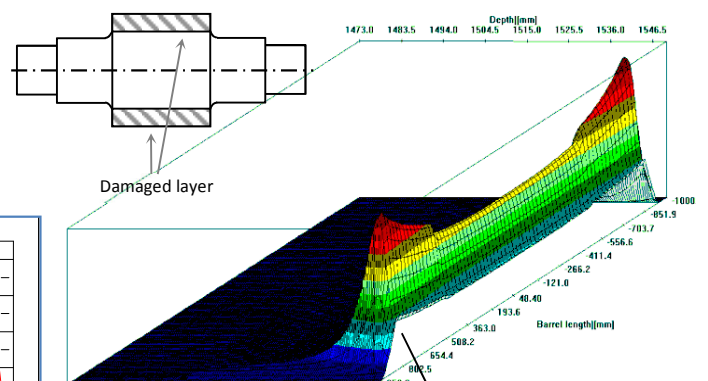
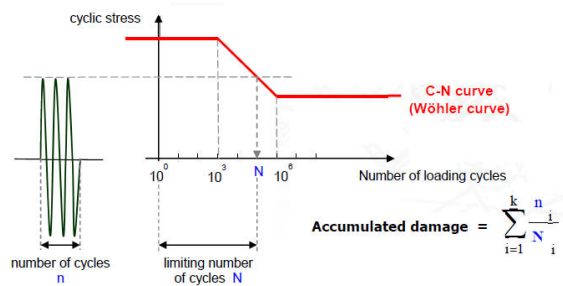
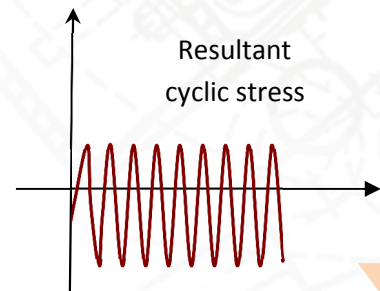


# Optimization of the Length of Backup Rolls Campaign

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

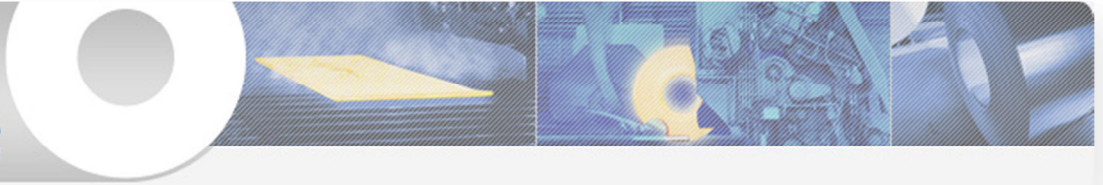
History of real proces loading of the Backup roll being saved continuously by the proces control system

Hertz contact load  
Bending load  
Residual stress

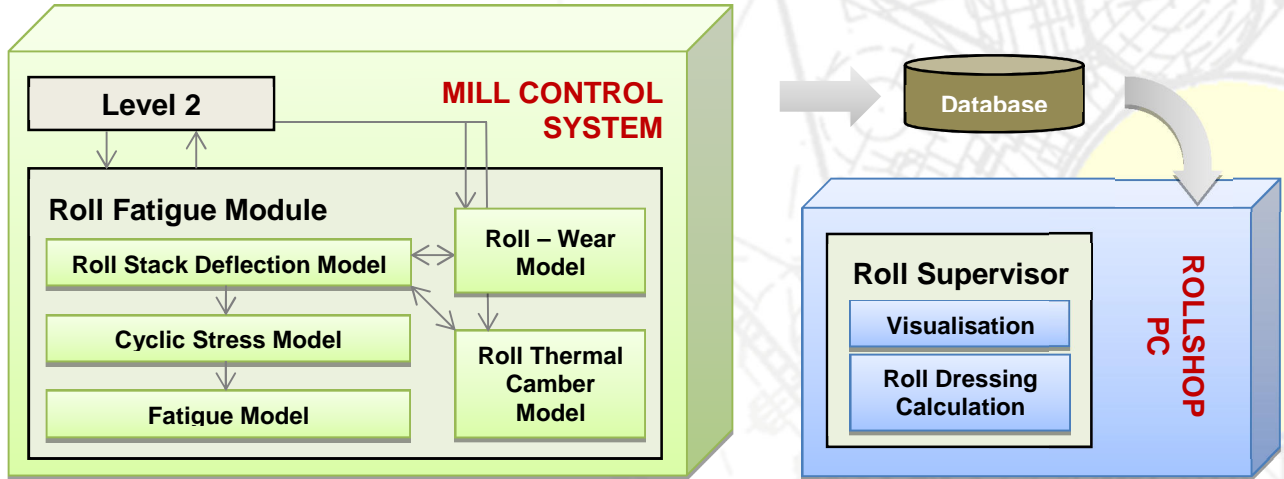


Predicted accumulated fatigue damage considering removal of dressing amount

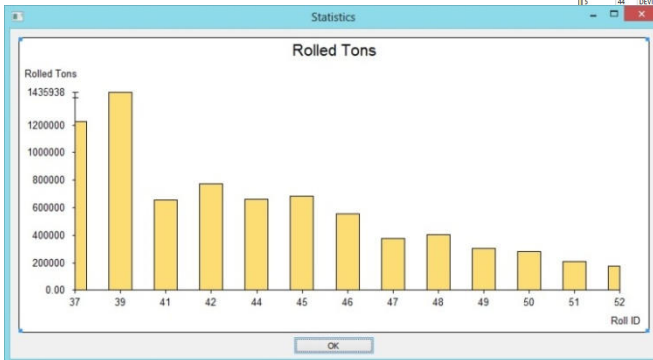
Predicted accumulated damage along the barrel length



*Basic scheme of the Roll Supervisor*

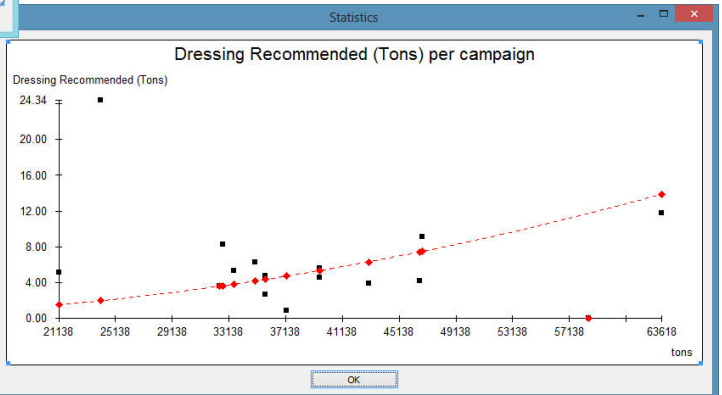


*Overview of the Roll Supervisor with displayed tons rolled by each roll*

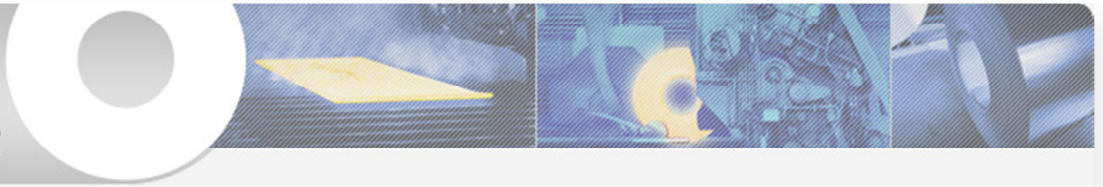


| Index | Roll ID | Producer | Cr % | Exploitation from | Diameter (mm) | Status          | Expected Campaigns | Expected Tonnage | Campaigns | Rolled Tons | Umm   | km    | km/mm | Price (Kč) | kct | kc/km | mm/kt  | mm to scrub diameter |
|-------|---------|----------|------|-------------------|---------------|-----------------|--------------------|------------------|-----------|-------------|-------|-------|-------|------------|-----|-------|--------|----------------------|
| 1     | 37      | NKMZ     | 2.90 | 2007-03-27 00:00  | 1611.79       | UT 23, sta. 3   |                    | 120000.0         | 31        | 122166.0    | 9528  | 72158 | 562.8 | 3887729.3  | 3.3 | 55.0  | 0.4198 | 11.79                |
| 2     | 39      | NKMZ     | 2.75 | 2007-06-09 00:00  | 1617.28       | UT 100, sta. 4  |                    | 160000.0         | 38        | 143593.8    | 11700 | 85696 | 688.0 | 4519200.3  | 3.1 | 32.0  | 0.3419 | 17.28                |
| 3     | 41      | NKMZ     | 2.71 | 2008-08-17 00:00  | 1654.83       | UT 23, sta. 15  |                    | 800000.0         | 22        | 600000.0    | 8072  | 39023 | 458.9 | 3324387.8  | 3.1 | 135.0 | 0.2173 | 54.53                |
| 4     | 42      | NKMZ     | 2.73 | 2008-10-02 00:00  | 1643.80       | UT 100, sta. 12 |                    | 480000.0         | 24        | 770289.7    | 8007  | 48994 | 505.1 | 6069646.7  | 2.9 | 124.0 | 0.4896 | 43.80                |
| 5     | 44      | DEVEX    | 3.20 | 2009-01-06 00:00  | 1666.93       | UT 23, sta. 18  |                    | 700000.0         | 24        | 600000.0    | 9029  | 42243 | 578.1 | 3588000.5  | 3.4 | 84.0  | 0.4430 | 66.93                |
| 6     | 513     |          |      | 2009-02-08 00:00  | 1671.06       | UT 23, sta. 19  |                    | 760000.0         | 21        | 662796.5    | 5904  | 40241 | 588.1 | 3588000.5  | 3.3 | 88.0  | 0.4039 | 71.06                |
| 7     | 270     |          |      | 2009-04-01 00:00  | 1640.05       | UT 45, sta. 11  |                    | 440000.0         | 17        | 316784.4    | 4569  | 23867 | 338.8 | 594100.0   | 3.0 | 165.0 | 0.7181 | 48.09                |
| 8     | 317     |          |      | 2010-08-10 00:00  | 1707.29       | UT23, sta. 29   |                    | 1180000.0        | 14        | 379026.6    | 11589 | 24115 | 737.2 | 3662000.8  | 2.7 | 153.0 | 0.3481 | 107.29               |
| 9     | 317     |          |      | 2010-08-10 00:00  | 1704.15       | UT23, sta. 28   |                    | 1120000.0        | 13        | 404182.4    | 11274 | 26931 | 751.2 | 3662000.8  | 3.1 | 137.0 | 0.3548 | 104.15               |
| 10    | 280     |          |      | 2011-06-02 00:00  | 1700.41       | UT 75, sta. 27  |                    | 1800000.0        | 9         | 380735.9    | 7722  | 19164 | 484.1 | 4787300.0  | 3.7 | 248.0 | 0.3180 | 100.41               |
| 11    | 280     |          |      | 2011-06-25 00:00  | 1721.71       | UT23, sta. 33   |                    | 1320000.0        | 9         | 381750.3    | 15404 | 17985 | 966.9 | 4787300.0  | 3.7 | 270.0 | 0.2387 | 121.71               |
| 12    | 316     |          |      | 2012-01-28 00:00  | 1724.08       | UT 23, sta. 34  |                    | 1380000.0        | 8         | 311480.1    | 13283 | 14148 | 888.4 | 3588000.5  | 3.7 | 353.0 | 0.3011 | 124.08               |
| 13    | 326     |          |      | 2012-02-17 00:00  | 1715.58       | UT 23, sta. 32  |                    | 1280000.0        | 6         | 172524.1    | 7176  | 10433 | 427.2 | 3588000.5  | 3.0 | 343.0 | 0.5574 | 115.58               |

| Roll Number | Roll Producer | Campaign | Stand       | Campaign Start | Tons     | Process | Kms     | Process | Barrel Diameter (mm) | Dressing (mm) | Rolled thickness 1.5-2.0 mm | Rolled thickness 2.1-5.0 mm | Rolled thickness 5.1-13.0 mm | Contact | Contact | Middle Force |
|-------------|---------------|----------|-------------|----------------|----------|---------|---------|---------|----------------------|---------------|-----------------------------|-----------------------------|------------------------------|---------|---------|--------------|
| 1           | 44            | 1H       | 2008-11-... | 58467          | 58467.9  | 3216    | 3216.6  | 1739.25 | 0.00                 | 6.8           | 64.7                        | 26.0                        | 808732.06                    | 0.00    | 0.00    | 0.00         |
| 2           | 44            | 2H       | 2009-02-... | 42967          | 101435.9 | 2732    | 5948.7  | 1735.38 | 0.00                 | 11.3          | 58.8                        | 29.2                        | 659954.00                    | 0.00    | 0.00    | 0.00         |
| 3           | 44            | 1H       | 2009-06-... | 21377          | 125731.1 | 1391    | 7240.1  | 1720.25 | 0.00                 | 6.7           | 62.1                        | 27.5                        | 311233.00                    | 0.00    | 0.00    | 0.00         |
| 4           | 44            | 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    | 0.00         |
| 5           | 44            | 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    | 0.00         |
| 6           | 44            | 2H       | 2010-01-... | 35001          | 241547.5 | 2303    | 14707.2 | 1713.92 | 0.00                 | 14.9          | 54.9                        | 28.3                        | 558913.00                    | 0.00    | 0.00    | 0.00         |
| 7           | 44            | 1H       | 2010-03-... | 35932          | 281050.4 | 2411    | 17119.0 | 1708.27 | 0.00                 | 10.9          | 58.3                        | 30.2                        | 604994.01                    | 0.00    | 0.00    | 0.00         |
| 8           | 44            | 1H       | 2010-04-... | 46592          | 327943.9 | 2718    | 19837.1 | 1704.02 | 0.00                 | 7.4           | 60.9                        | 30.9                        | 693987.00                    | 0.00    | 0.00    | 0.00         |
| 9           | 44            | 1H       | 2010-09-... | 63617          | 391261.1 | 3627    | 23464.3 | 1692.21 | 0.00                 | 0.0           | 0.0                         | 0.0                         | 0.00                         | 0.00    | 0.00    | 0.00         |
| 10          | 44            | 2H       | 2010-11-... | 35681          | 426942.9 | 2080    | 23544.8 | 1687.43 | 0.00                 | 10.2          | 57.3                        | 31.0                        | 515600.09                    | 0.00    | 0.00    | 0.00         |
| 11          | 44            | 2H       | 2011-01-... | 32438          | 494407.2 | 1984    | 27328.8 | 1685.78 | 0.00                 | 12.1          | 58.9                        | 27.7                        | 476413.05                    | 0.00    | 0.00    | 0.00         |
| 12          | 44            | 2S       | 2011-04-... | 32716          | 482193.7 | 1838    | 20367.3 | 1675.47 | 0.00                 | 0.0           | 0.0                         | 0.0                         | 0.00                         | 0.00    | 0.00    | 0.00         |
| 13          | 44            | 2H       | 2011-06-... | 35691          | 527811.5 | 2119    | 31486.8 | 1672.75 | 0.00                 | 9.4           | 0.0                         | 0.0                         | 0.00                         | 0.00    | 0.00    | 0.00         |
| 14          | 44            | 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    | 0.00         |
| 15          | 44            | 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    | 0.00         |
| 16          | 44            | 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    | 0.00         |



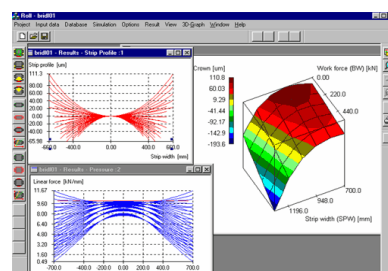
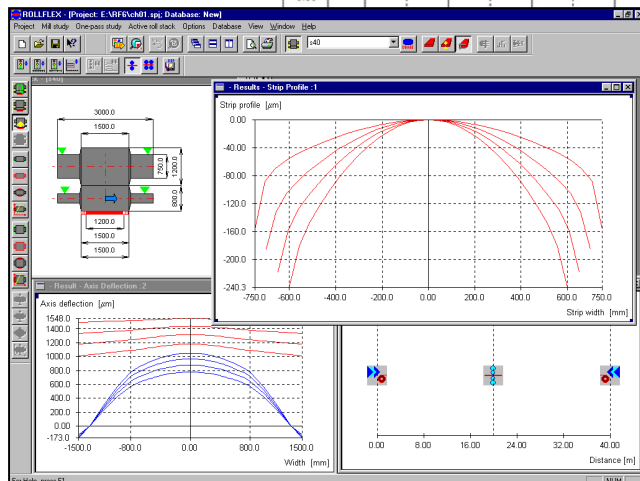
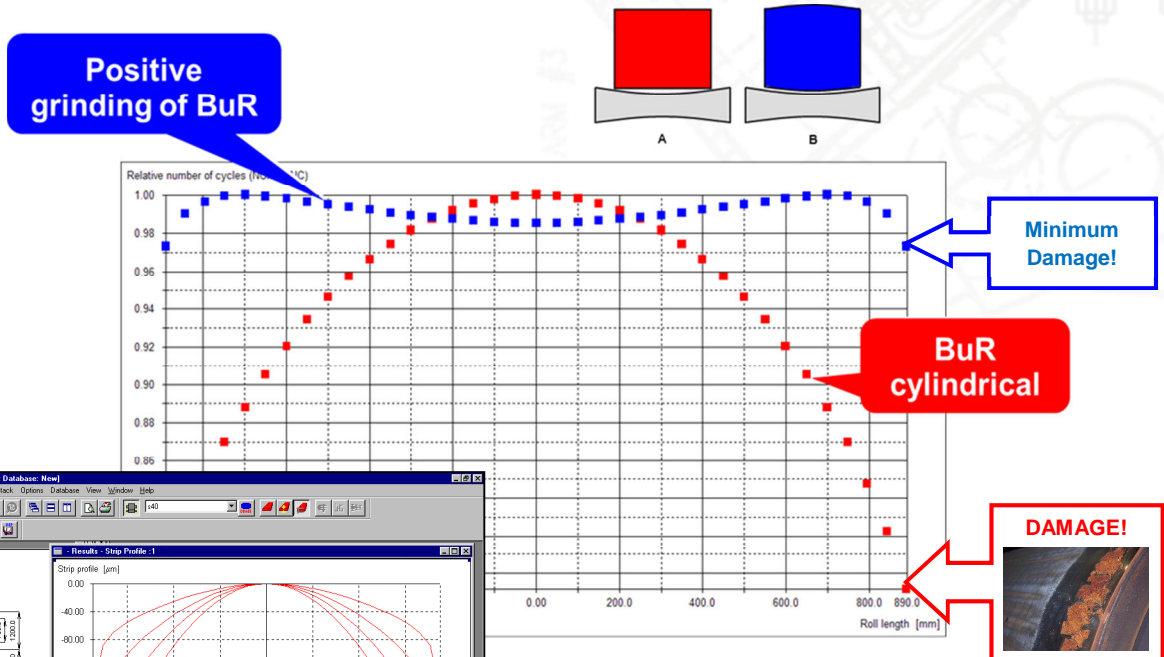
*Selected roll details and prediction of recommended dressing / grinding amount*



**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