

EMISSIONS OF SMALL SCALE PELLET PLANTS

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CEBC 2017-01-19, IEA-Workshop: TASK 32

- Legal Framework
- Development of the emissions and limit values
- Project on fuel quality – selected results
- Conclusions

- **So far:** Positiv type testing – requirement and emission limit values in:
 - EN 303 Heating boilers - Part 5: Heating boilers for solid fuels
 - Art. 15a B VG über das Inverkehrbringen von Kleinf Feuerungen und die Überprüfung von Feuerungsanlagen und Blockheizkraftwerken

- **New:**

LOT 1:

26.September 2015

Publication of LOT 1+2 Labelling
Regulation at Official Journal 26.9.2013
with transitional period of 2 years



obligation on labelling and
standard product information
of the consumption of energy 26.09.2015

LOT 15:

April 2017

2020

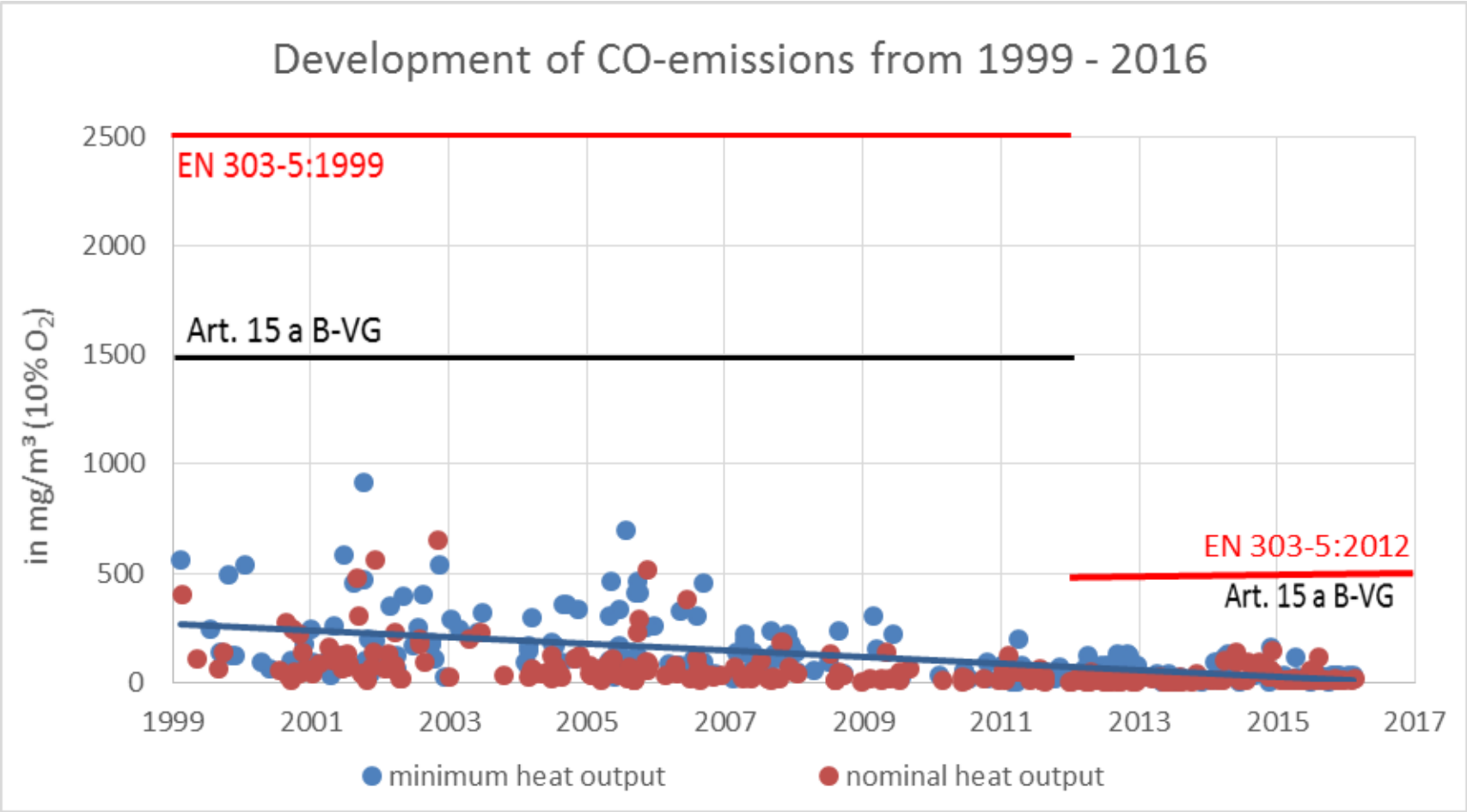
Resolution
EC

Publication with
transitional period of
2 years

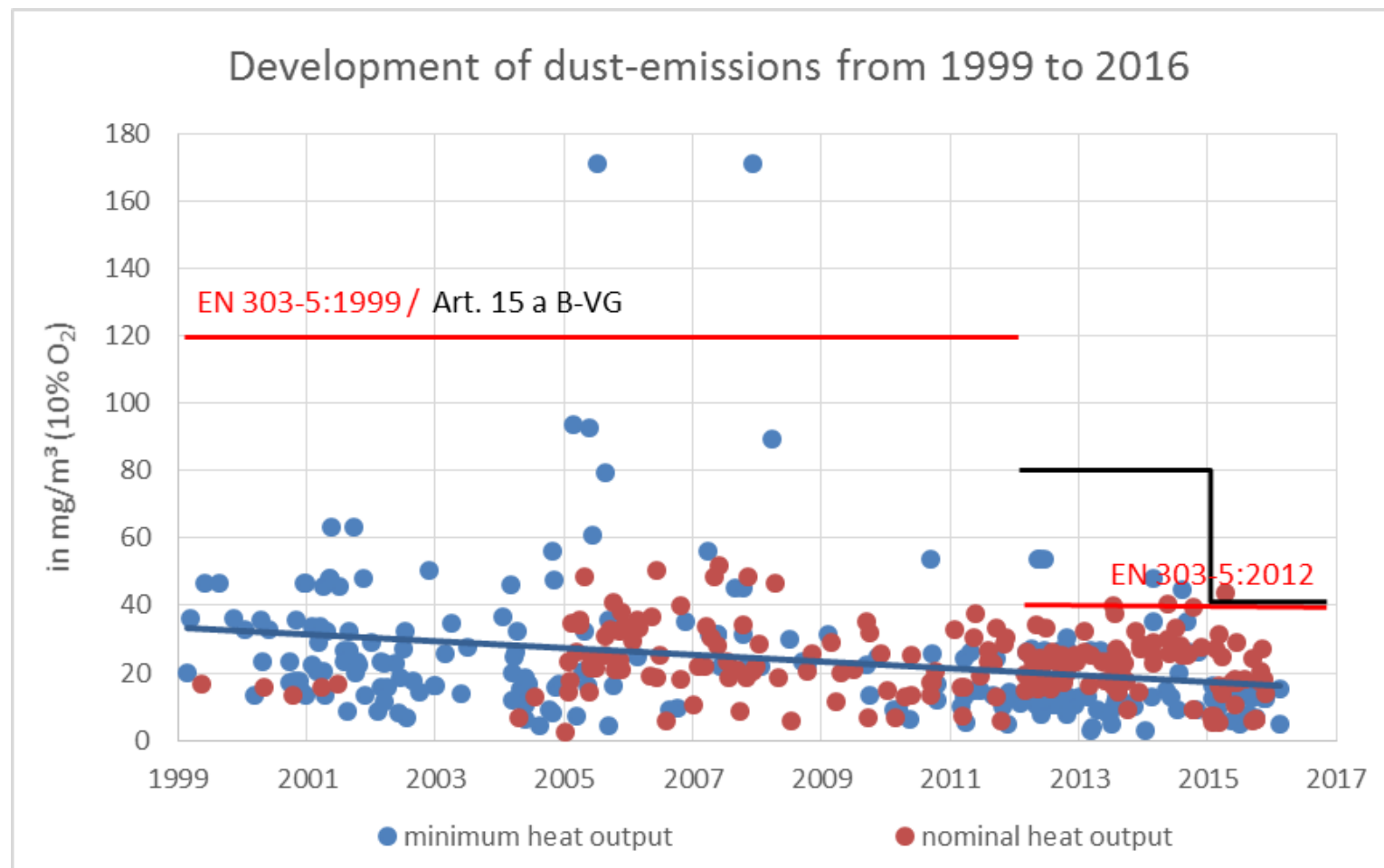


obligation on labelling and
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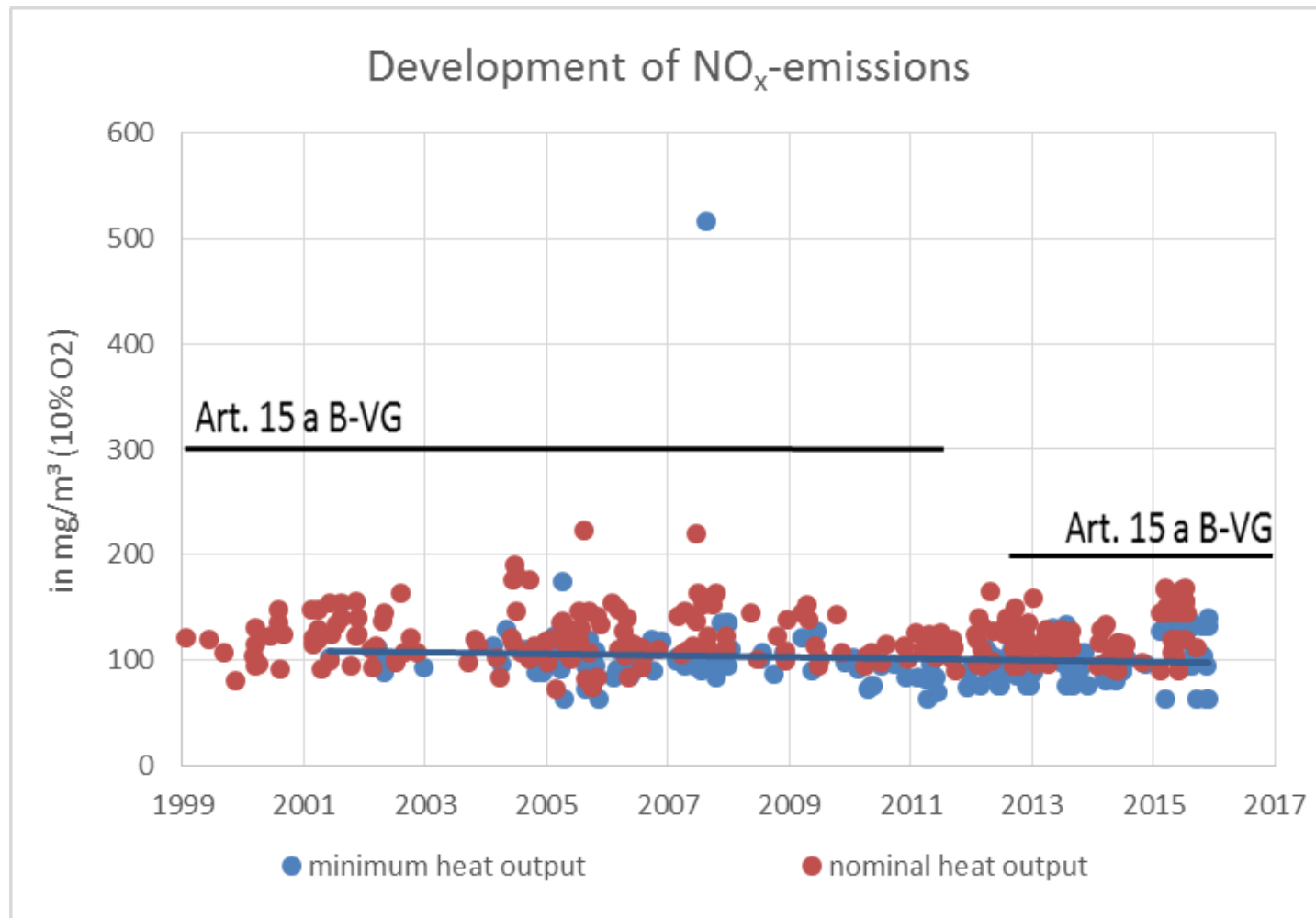
EMISSIONS AT THE BENCH TESTS



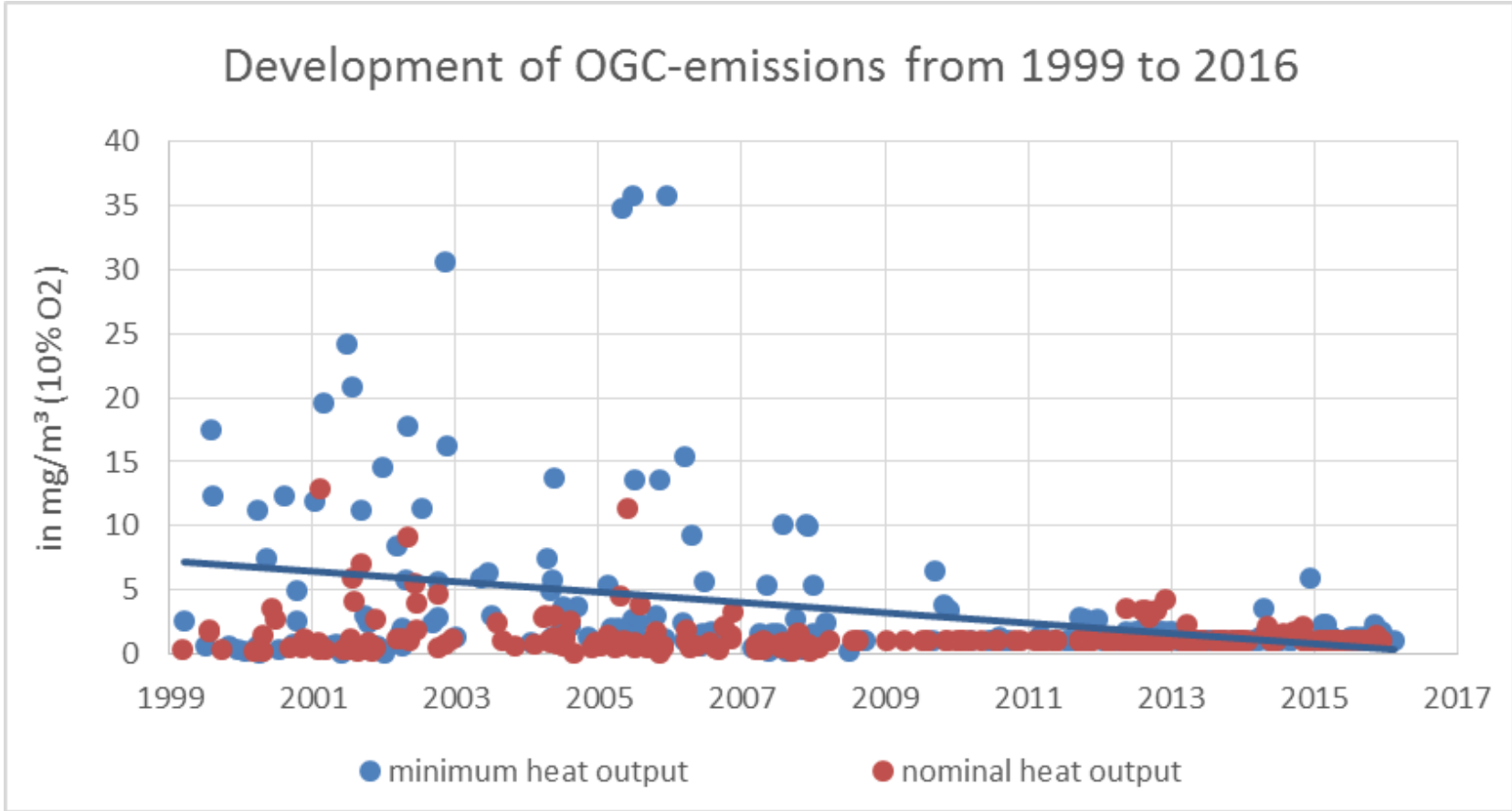
Results of the BLT Wieselburg boiler tests, only positive test results are included



Results of the BLT Wieselburg boiler tests, only positive test results are included



No regulations for NO_x at **EN 303-5:1999**; Annex Austria 2012



Reduction of the limit values:

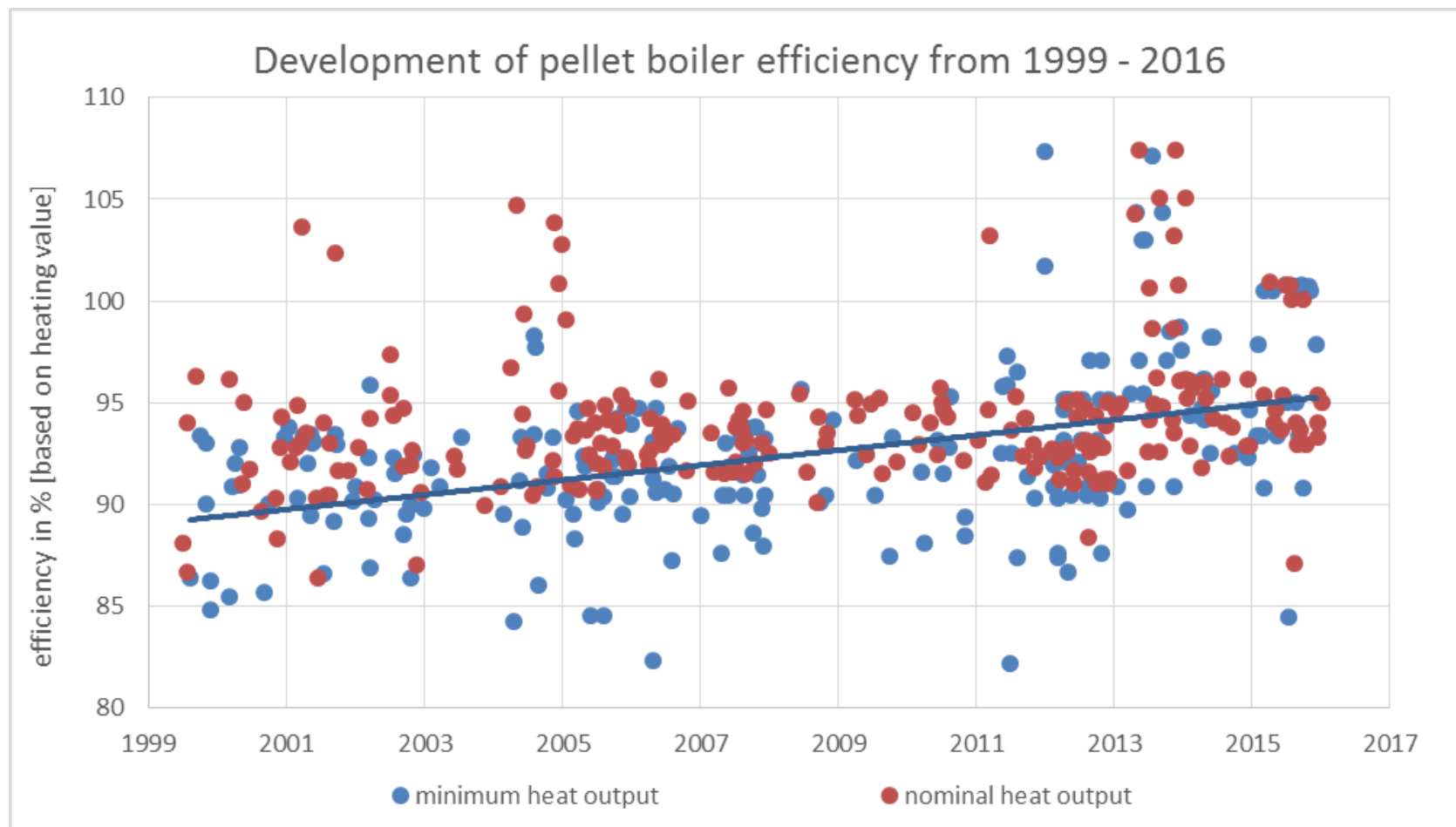
EN 303-5: 1999 / Art. 15 a B-VG
80 mg/m³ (10% O₂)



EN303-5: 2012 / Art. 15 a B-VG
20 / 40 mg/m³ (10% O₂)

Results of the BLT Wieselburg boiler tests, only positive test results are included

EMISSIONS AT THE BENCH TESTS



Results of the BLT Wieselburg boiler tests, only positive test results are included

project background

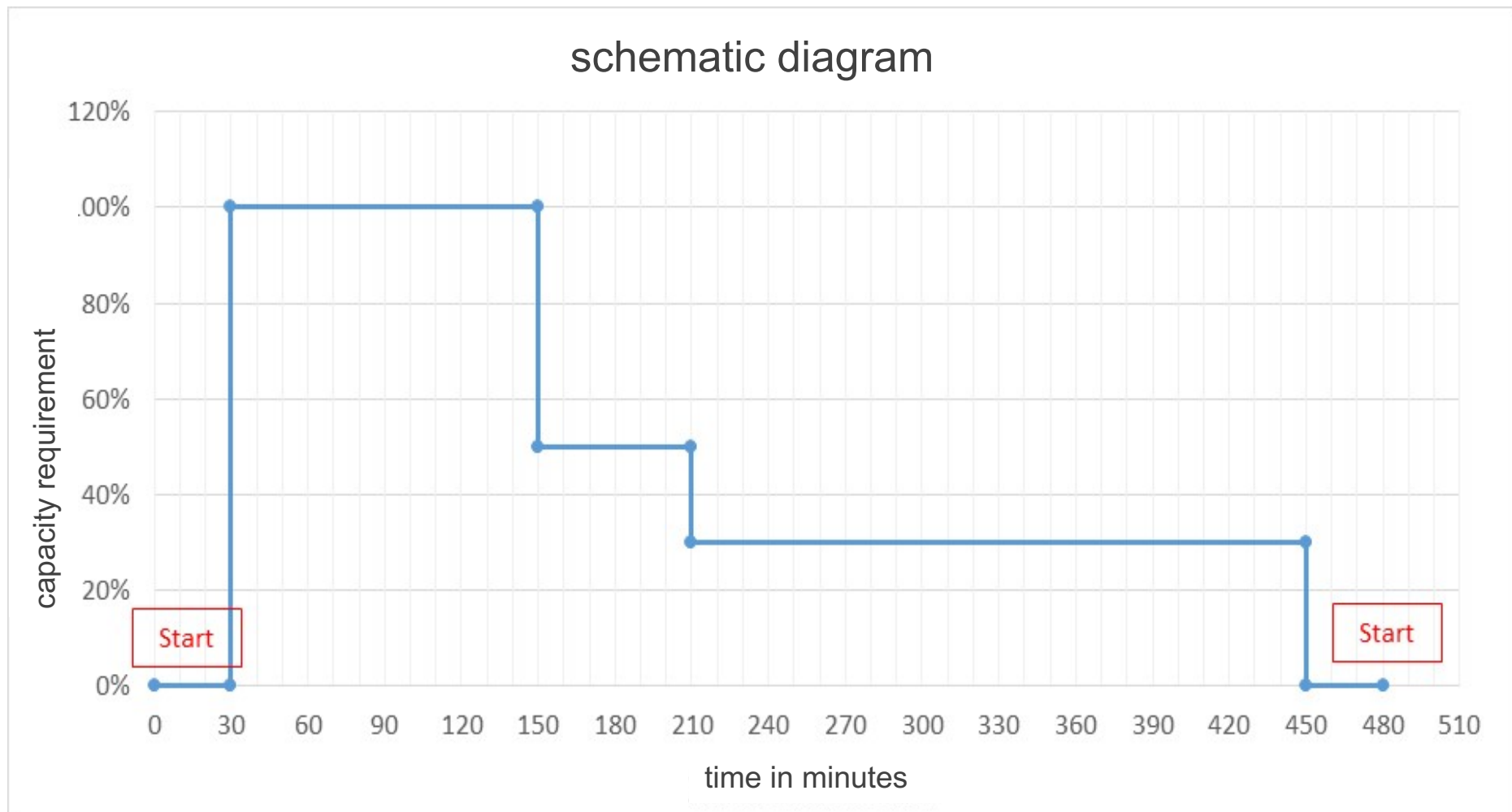
- current fuel specifications allow considerable variation in A1 pellets (EN ISO 17225-2)
- significantly different dust emissions in class A1 pellets are observed
- Beside the technological influence, the fuel quality is important – small changes with great effect – leak of data!
- survey parameters : CO, CO₂, NO_x, OGC, dust-emissions (gravimetric) and particulate matter by ELPI

- Long term test with load cycle over 500 hours of operation per plant and fuel quality
 - Beside measurements according EN 303-5 as reference - 32 measurements during the cycle to log changes
- ➡ more than 4.000 operating hours with the load cycle



Practice-oriented long-term test (8 h load cyclus) – 63 repetitions

schematic diagram



Experimental design:

- 4 pellet boilers – 2 fuel qualities:

- | | | |
|-------------------------------------|---|-----------|
| 1. EN 303-5 measuring | } | Pellets 1 |
| 2. Load cycles 3 weeks | | |
| 3. EN 303-5 measuring (non-cleaned) | | |
| 4. EN 303-5 measuring (cleaned) | | |
| 5. EN 303-5 measuring | } | Pellets 2 |
| 6. Load cycles 3 weeks | | |
| 7. EN 303-5 measuring (non-cleaned) | | |
| 8. EN 303-5 measuring (cleaned) | | |

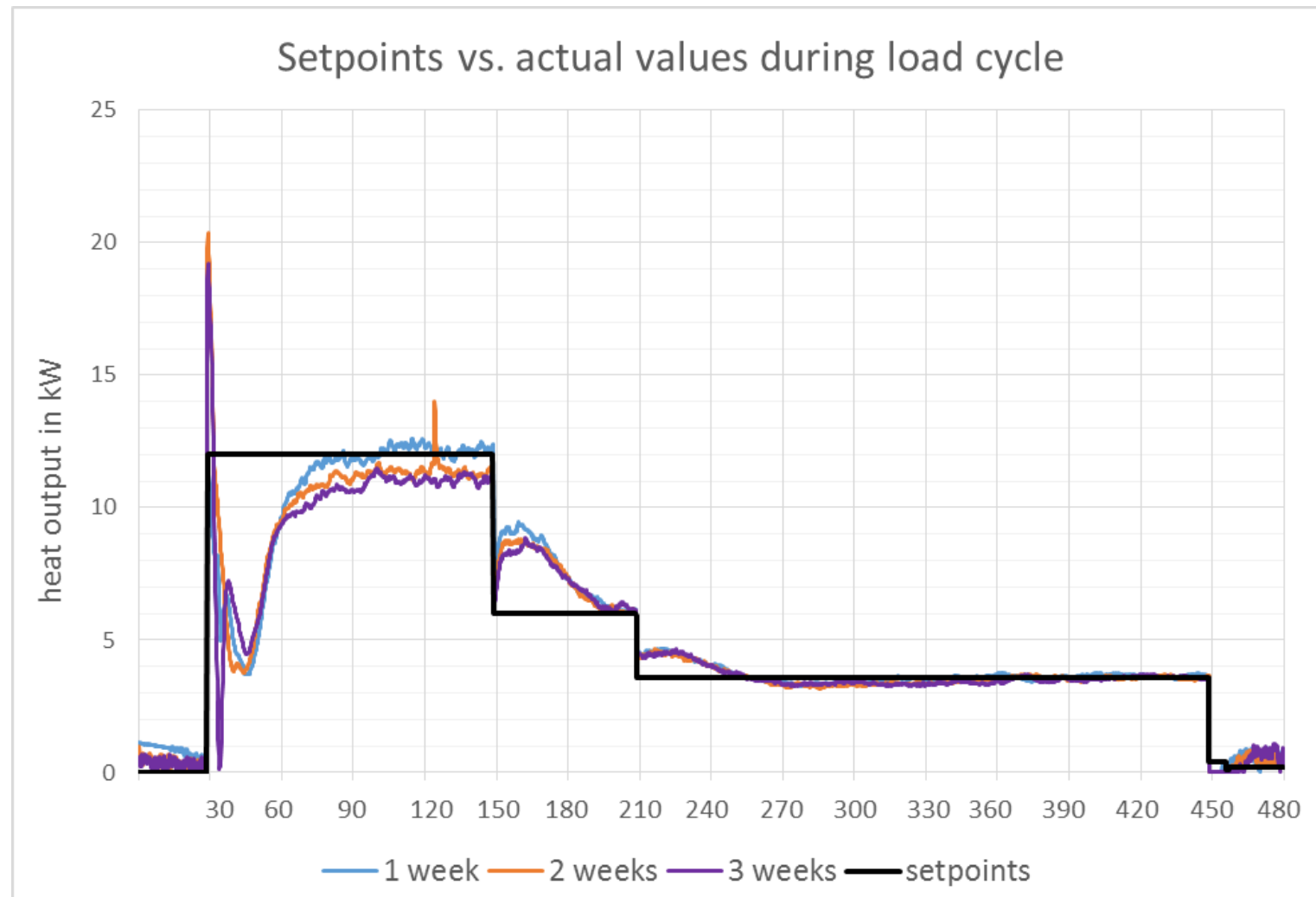
- set of parameters: CO, CO₂, NO_x, OGC, dust emissions (gravimetric) and particle matters by ELPI

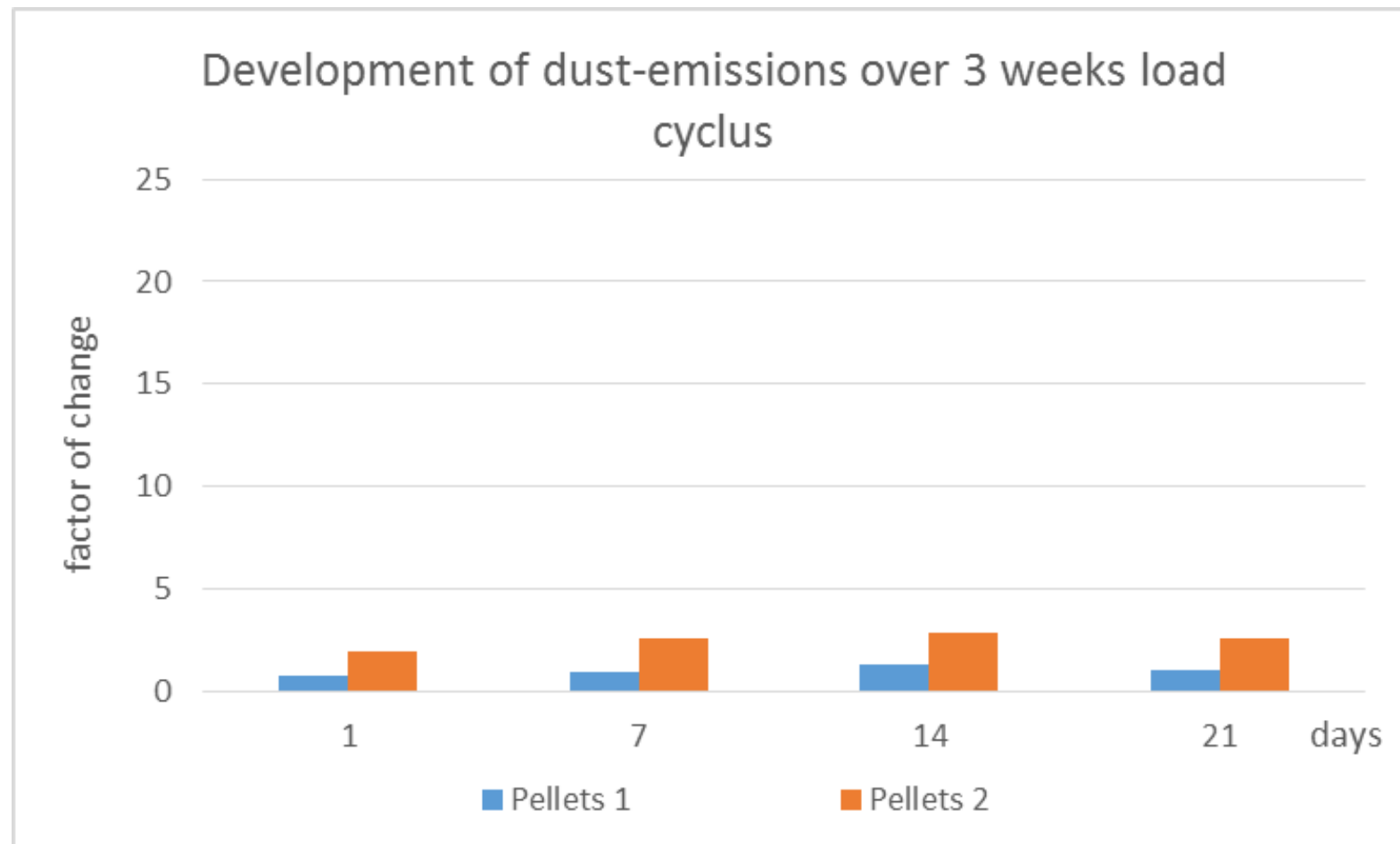
chemical properties

parameter	Pellets 1	Pellets 2
Carbon C	48,7 %	49,2 %
Hydrogen H	6,2 %	6,3 %
Nitrogen N	0,1 %	0,1 %
Sulfur S	< 0,02 %	< 0,02 %
Calcium Ca	890 mg/kg	1300 mg/kg
Phosphorus P	82 mg/kg	110 mg/kg
Magnesium Mg	155 mg/kg	178 mg/kg
Potassium K	330 mg/kg	1240 mg/kg
Sodium Na	70 mg/kg	130 mg/kg
Copper Cu	5,7 mg/kg	7,7 mg/kg
Chromium Cr	2,4 mg/kg	3,8 mg/kg
Iron Fe	65 mg/kg	83 mg/kg

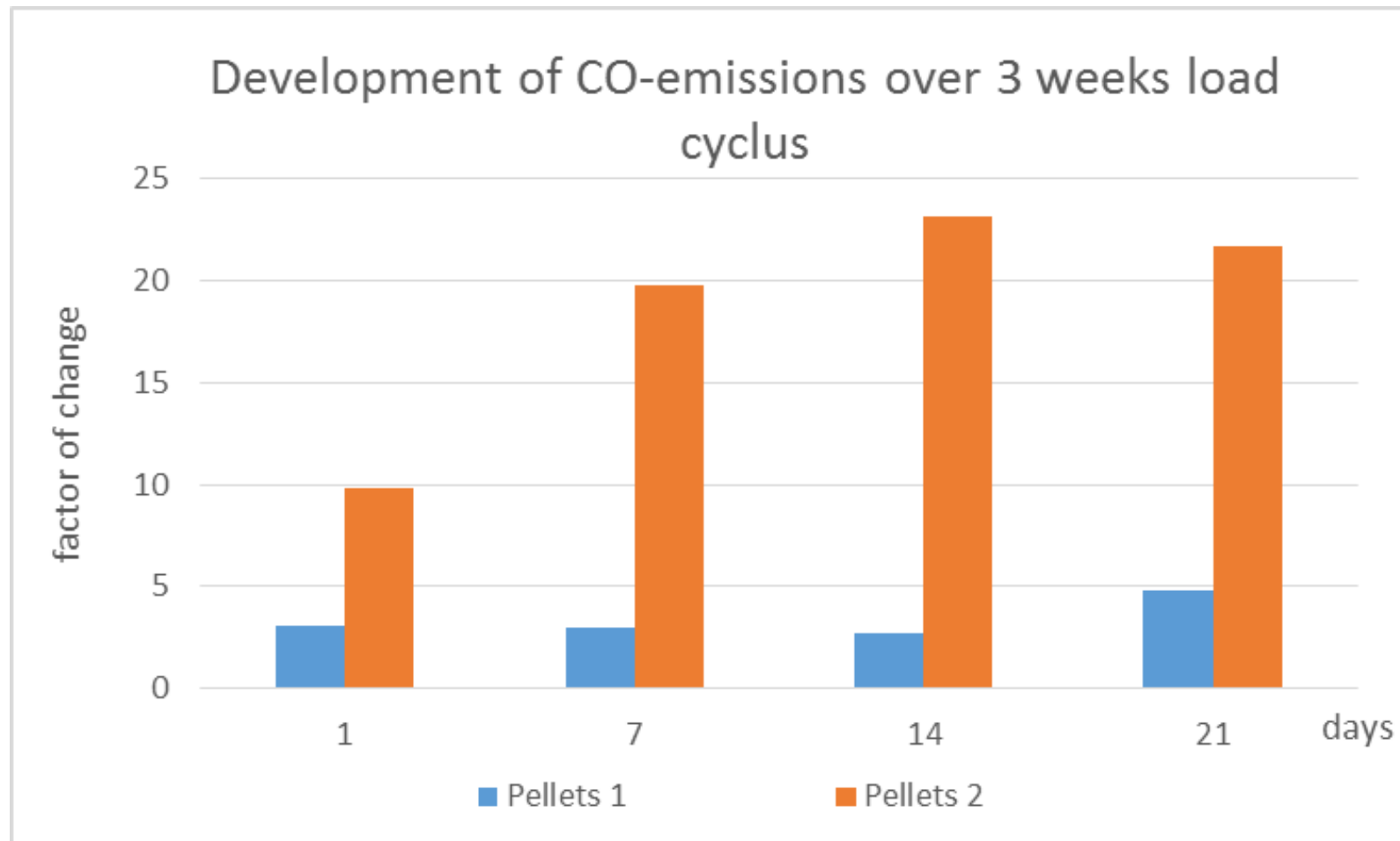
Ash melting behaviour (CEN/TS 15370-1:2006)

	Pellets 1 [°C]	Pellets 2 [°C]
Shrinkage temperature, ST	1199	820
Deformation temperature, DT	1259	850
Hemisphere temperature, HT	1456	1490
Flow temperature, FT	1464	1500



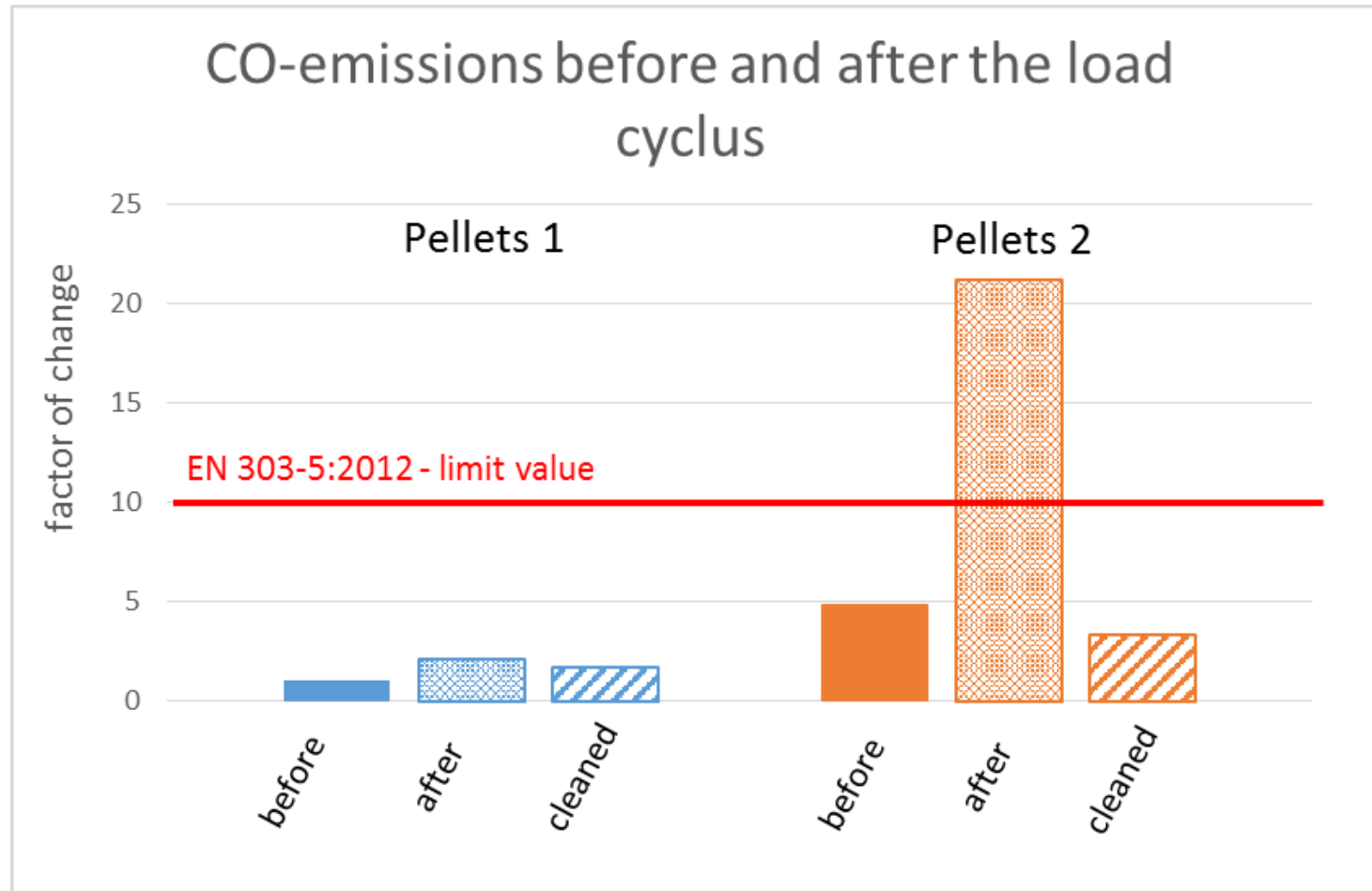


Basis of the scaling is the average value of the reference measurement with Pellets 1 during test bench conditions according to EN 303-5:2012.



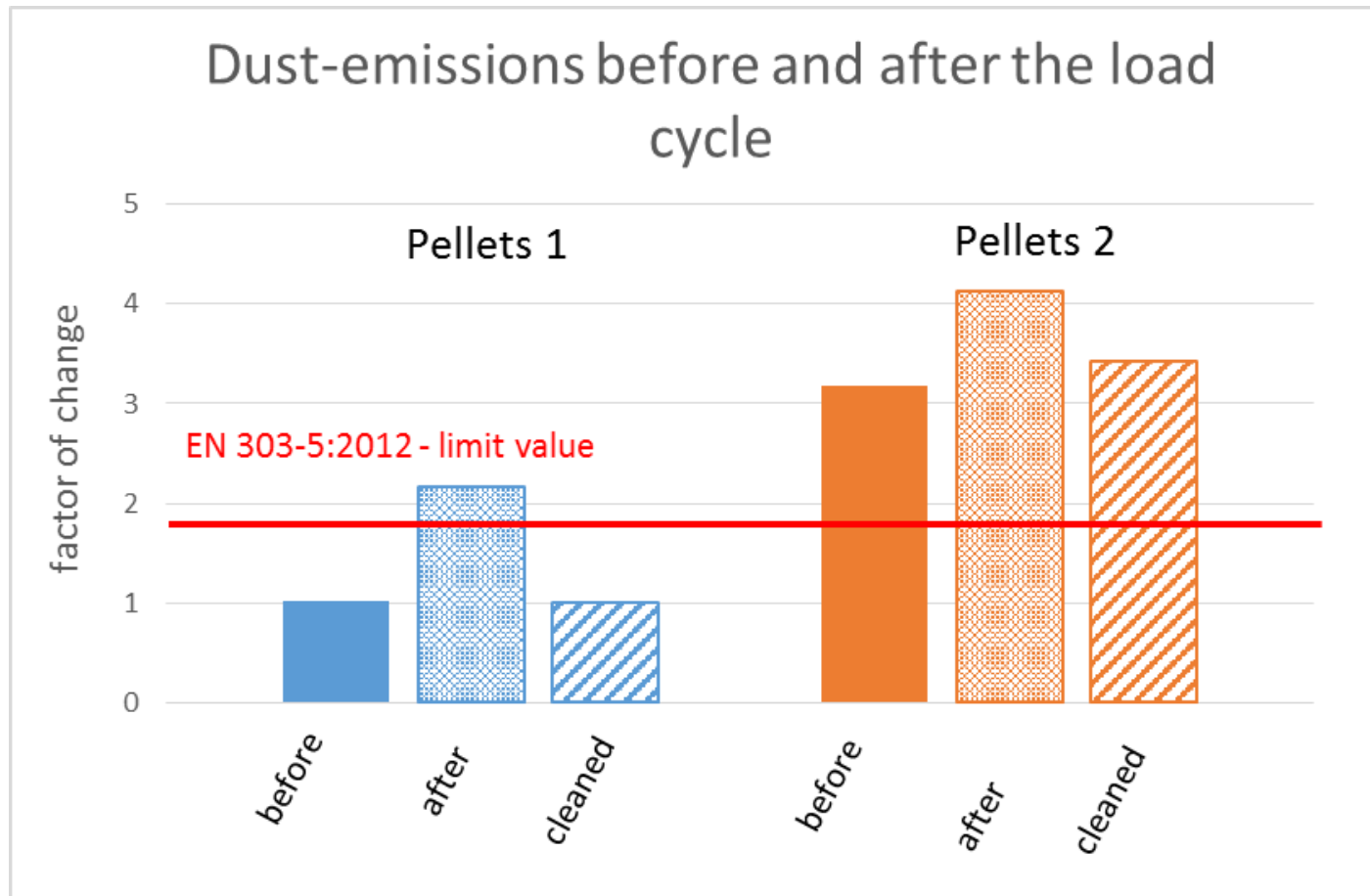
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Effect of long-term tests with load cycle and cleaning measures

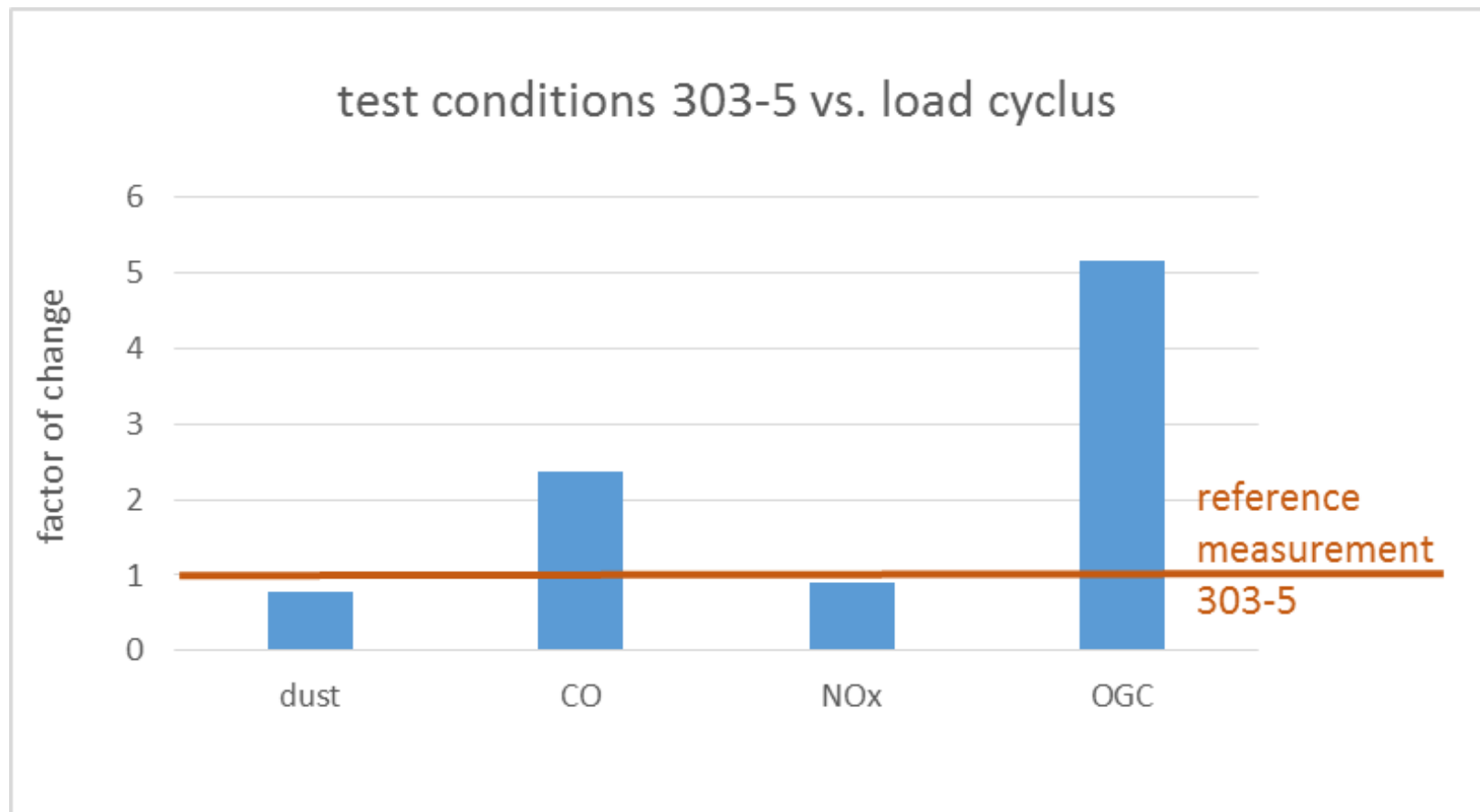


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- In addition to the technical improvements of the heating boiler, the limits were constantly tightened – almost no gap between limit values and test bench results
- Fuels quality has an important influence – to reach low emission level also high quality fuels are needed
- Strong correlation between aerosol creating elements (Potassium) and dust emissions – operation status and safety because of ash melting
- Aerosol creating elements (potassium) should be considered in future fuel specifications
- Regularly cleaning and maintenance of boiler result in significant reductions in emissions
- Minor differences of dust-emissions between load cycle and test bench conditions according to EN 303-5:2012 - big differences in CO- and OGC-emissions because of load changes and no static operation conditions



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