Cold wash –
The cool and modern way to launder

Barbara Josephy
Eric Bush
Sophie Attali
Francisco R. Zuloaga

Topten International Services TIS

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eceee 2015
Summer Study on energy efficiency
1– 6 June 2015
Presqu' île de Giens, Toulon/Hyères, France

European Commission

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European Climate Foundation

Agenda

- **Introduction**
- Testing methodology
- Test results
- Summary and recommendations

Cold wash = washing at 15-20°C

- Washing of clothes/textiles is part of our lives
- Main share of electricity consumption: heating up cold tap water to up to 90-95°C
- Cold wash saves 60% electricity as compared to 40°C

www.lwl.org

Cold wash saves (lots of) electricity

- Saving potential of cold wash in EU-27
  - up to 11 TWh/year
  - 2,200 million € per year
  - annual production of the nuclear power plant Emsland (DE)

→ We should re-think our everyday routine

www.nadir.org

Assumptions
•EU-27-stock washing machines: around 180 million units (2013, «Omnibus» Review Study 2014)
•Total electricity consumption: 19 TWh / year («Omnibus» Review Study 2014)
•Electricity tariff: 0.20 € / kWh
•Nuclear power plant Emsland (Germany): 11.5 TWh 2013 (Wikipedia)

Barriers are psychological rather than technical

- EEDAL-Paper 2013:
  Cold Wash – Do Prejudices Impede High Energy Savings? (Josephy et al.)
  - 20°C-cycle is required by Ecodesign Regulation 1015/2010.
  - Detergent designed for cold wash are also available.
  - Prejudice, tradition and custom stop consumers from cold-washing

Facts could help overcome psychological barriers

- Discussions on cold wash – especially on washing performance – run controversial and emotional.

- Tests in Dec'14 to contribute scientific facts to the debate:
  - **Topten.eu**
  - **VDE** Testing and Certification Institute (Germany)
  - Consumer Organisation **Stiftung Warentest** (Germany)
  - on behalf of **EKZ** (electrical utility in CH)

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We compared washing at 40°C vs 20°C

- We measured:
  - Washing performance
  - Energy consumption
  - Programme duration

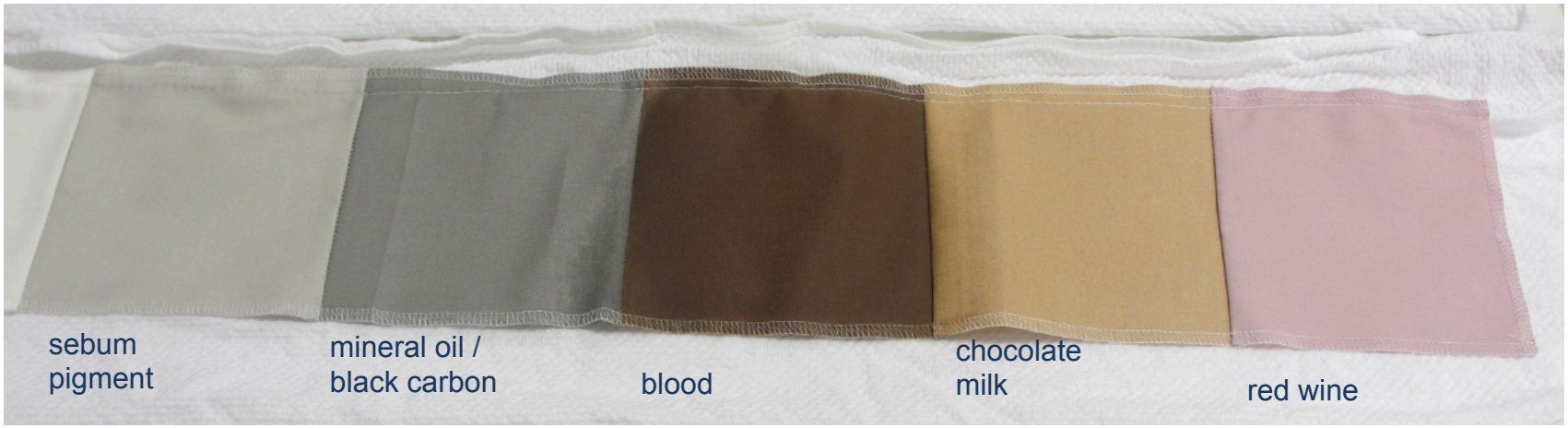
- Factors influencing the washing performance:
  - Detergent (good/medium/sufficient)
  - Pre-treatment of stains (yes/no)
  - Washing machine (good/medium/sufficient)
  - Loading (half/full)

5 variables, 24 combinations, 18 test arrangements.

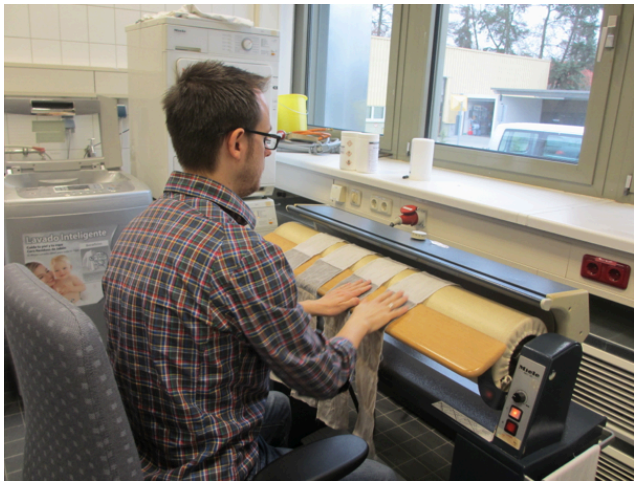
Fix parameters	Varying Parameters	Temperature
No soil remover Good machine Half-load	Good detergent	20°C
		40°C
	Medium detergent	20°C
		40°C
	Sufficient detergent	20°C
		40°C
Good detergent Good machine Half-load	Soil remover	20°C
		40°C
	No soil remover	20°C
		40°C
Sufficient detergent Sufficient machine Half-load	Soil remover	20°C
		40°C
	No soil remover	20°C
		40°C
Medium detergent Half-load	Good machine	20°C
		40°C
	Medium machine	20°C
		40°C
	Sufficient machine	20°C
		40°C
Good machine Medium detergent No soil remover	Half-load	20°C
		40°C
	Full-load	20°C
		40°C

Test conditions followed the EN 60456

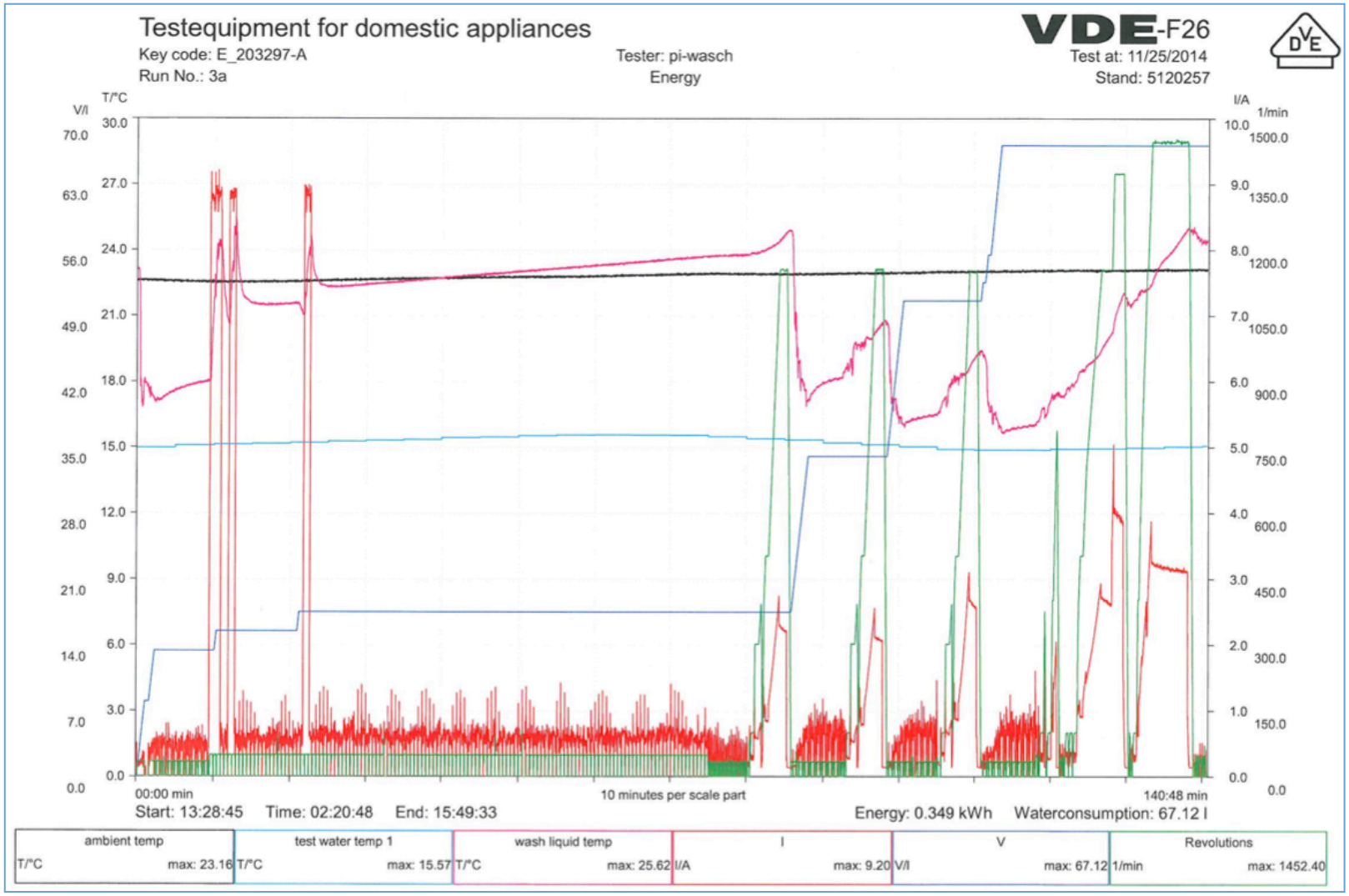
- Test laundry
- Number of laundry pieces
- Test cycles
- Standardised soiling
- Water hardness



Test conditions followed the EN 60456



We monitored electricity consumption and programme duration of washing cycles.



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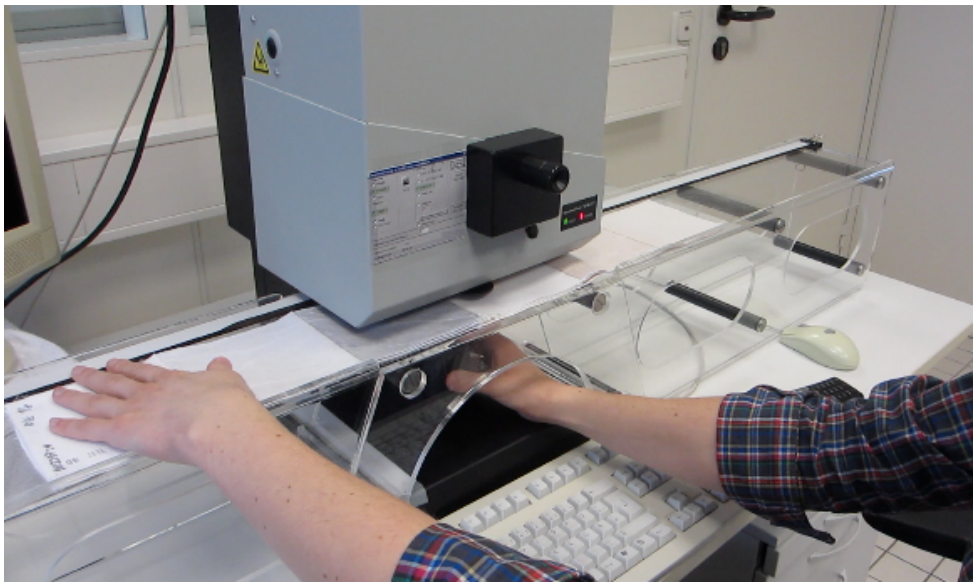
We calculated the Washing Efficiency Index of each washing cycle

- After washing / drying:
  - Measurements of reflectance of soilings: C_1, C_2 … C_5
  - $C_{test} = C_1 + C_2 \ldots + C_5$
  - Washing Efficiency Index = $I_{test} = C_{test} / C_{ref,\ 60°C}$



Example	
C_{test}	320.40
$(C_{ref,\ 60°C})$	330.37
Washing Efficiency Index $(C_{test} / C_{ref,\ 60°C})$	***0.970***

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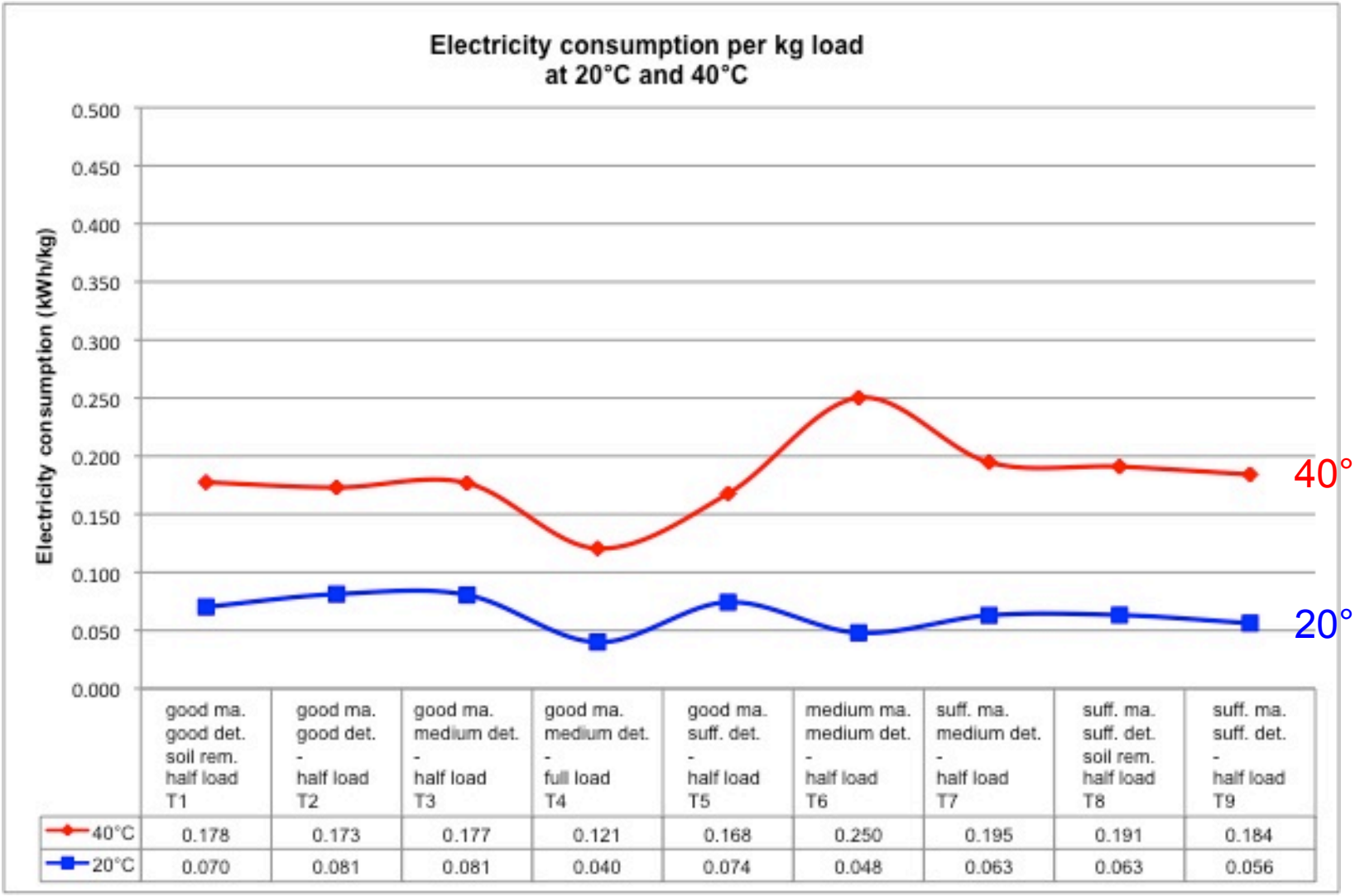
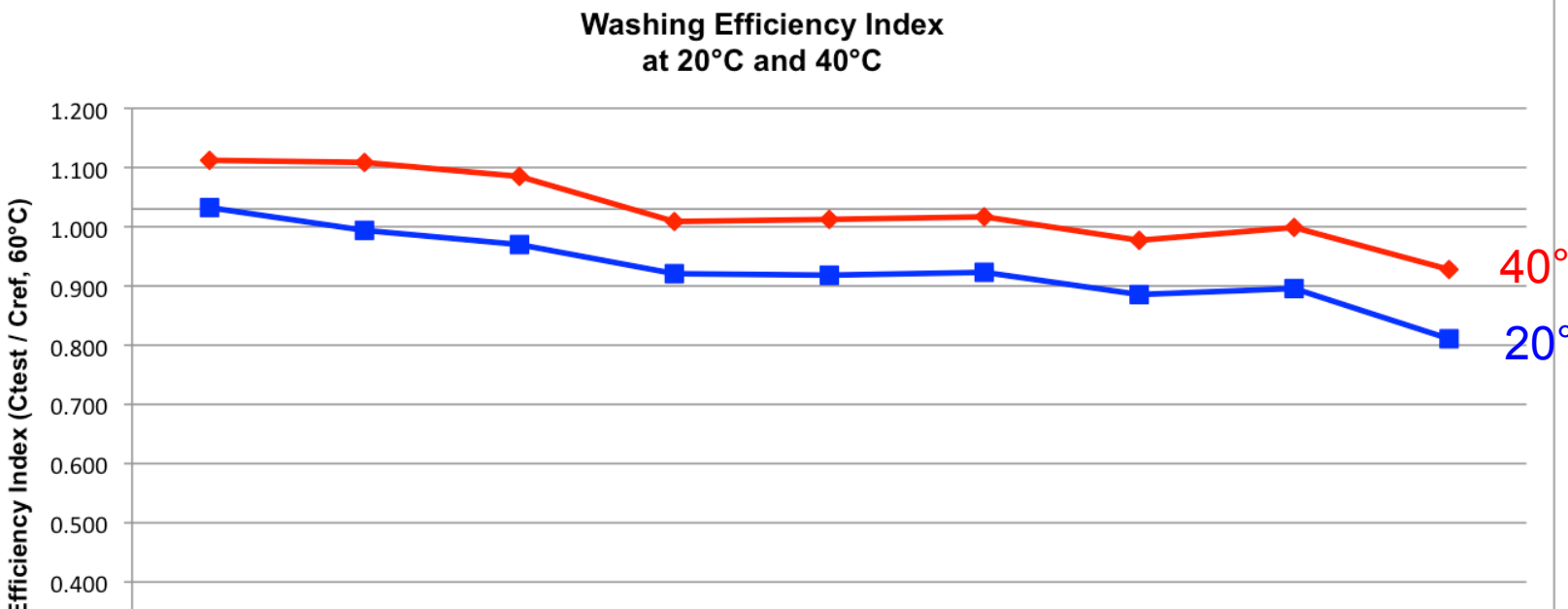
60% less electricity use at 20°C than at 40°C



	good ma. good det. soil rem. half load T1	good ma. good det. - half load T2	good ma. medium det. - half load T3	good ma. medium det. - full load T4	good ma. suff. det. - half load T5	medium ma. medium det. - half load T6	suff. ma. medium det. - half load T7	suff. ma. suff. det. soil rem. half load T8	suff. ma. suff. det. - half load T9
40°C	0.178	0.173	0.177	0.121	0.168	0.250	0.195	0.191	0.184
20°C	0.070	0.081	0.081	0.040	0.074	0.048	0.063	0.063	0.056

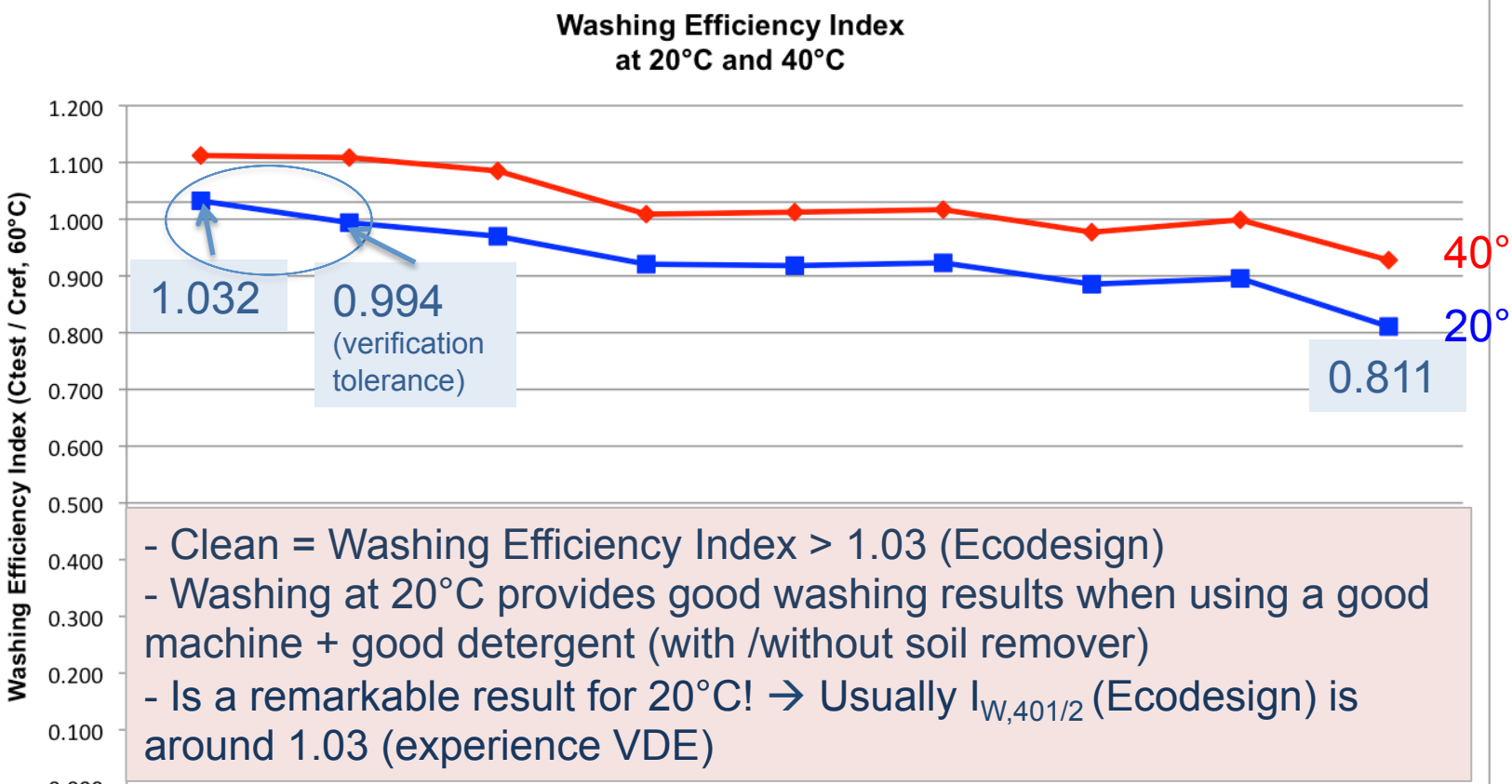
Washing performance 10% lower on average at 20°C



20°C in average 10% below 40°C
Mainly due to shorter programme times at 20°C! (see below)

	good ma. good det. soil rem. - half load T1	good ma. good det. - half load T2	good ma. medium det. - half load T3	good ma. medium det. - full load T4	good ma. suff. det. - half load T5	medium ma. medium det. - half load T6	suff. ma. medium det. - half load T7	suff. ma. suff. det. soil rem. half load T8	suff. ma. suff. det. - half load T9
40°C	1.112	1.109	1.085	1.009	1.012	1.017	0.977	0.999	0.928
20°C	1.032	0.994	0.970	0.921	0.918	0.923	0.885	0.896	0.811

Good washing performance at 20°C is possible



- Clean = Washing Efficiency Index > 1.03 (Ecodesign)
- Washing at 20°C provides good washing results when using a good machine + good detergent (with /without soil remover)
- Is a remarkable result for 20°C! → Usually $I_{W,401/2}$ (Ecodesign) is around 1.03 (experience VDE)

	good ma. good det. soil rem. - half load T1	good ma. good det. - half load T2	good ma. medium det. - half load T3	good ma. medium det. - full load T4	good ma. suff. det. - half load T5	medium ma. medium det. - half load T6	suff. ma. medium det. - half load T7	suff. ma. suff. det. soil rem. half load T8	suff. ma. suff. det. - half load T9
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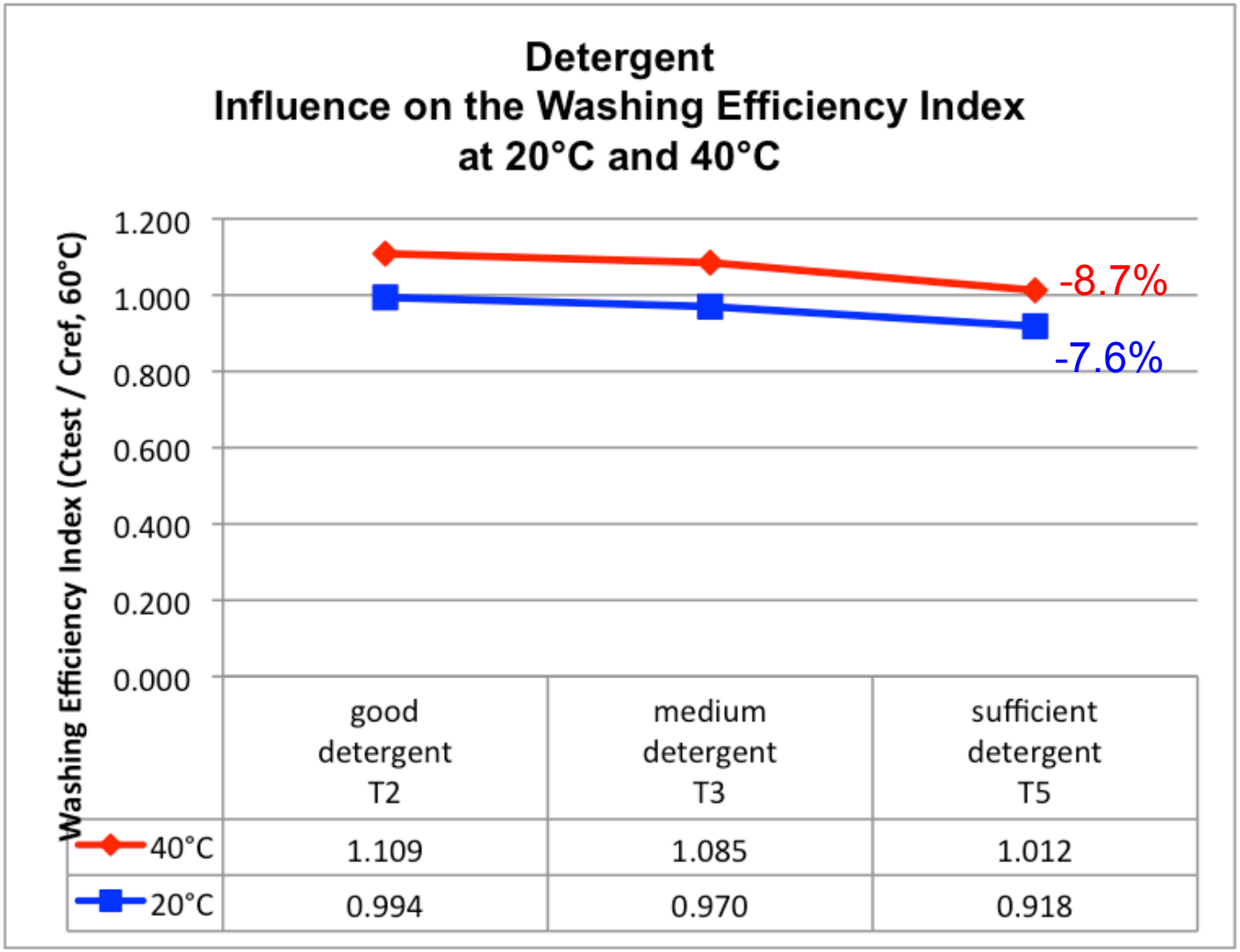
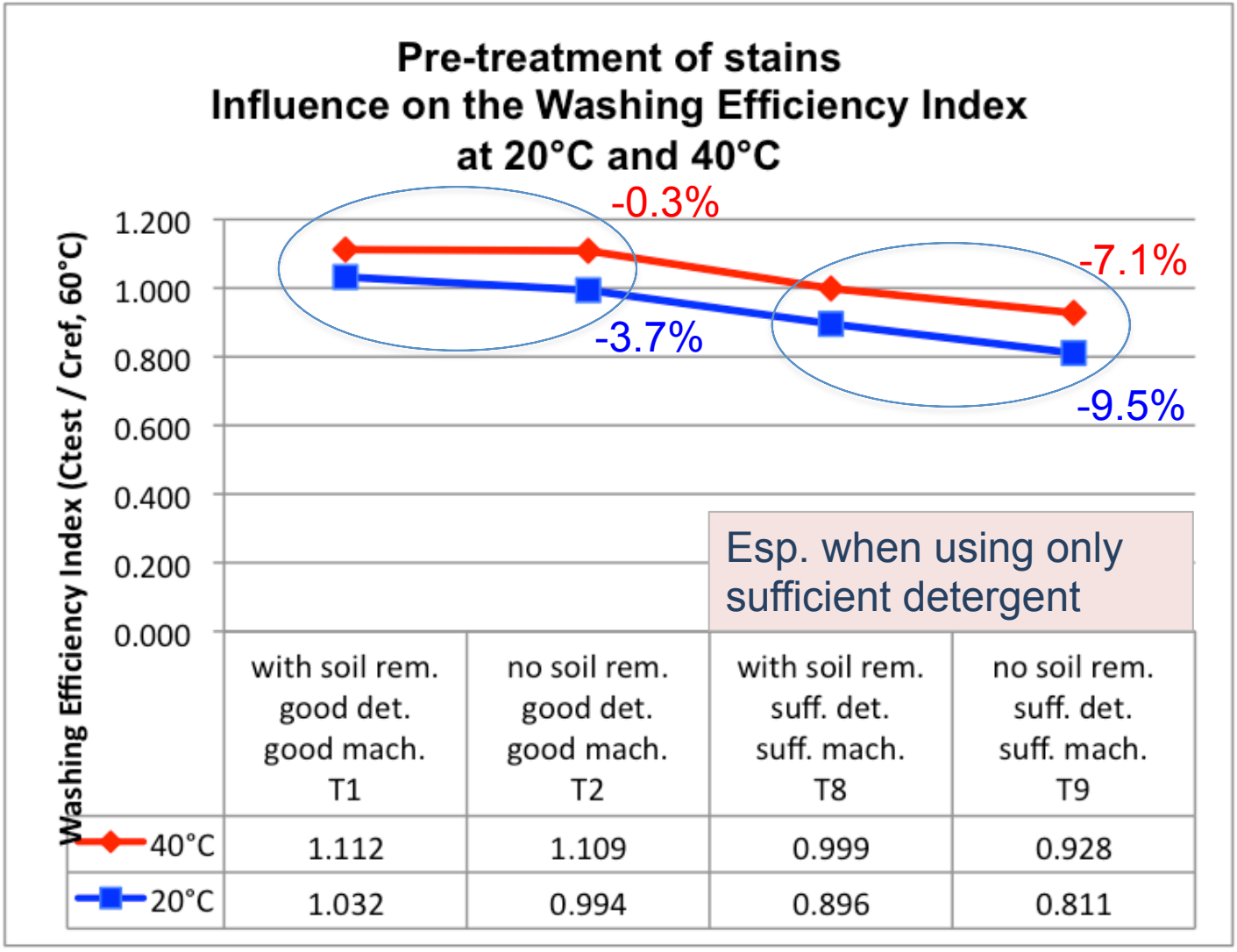
Washing performance increases with quality detergents



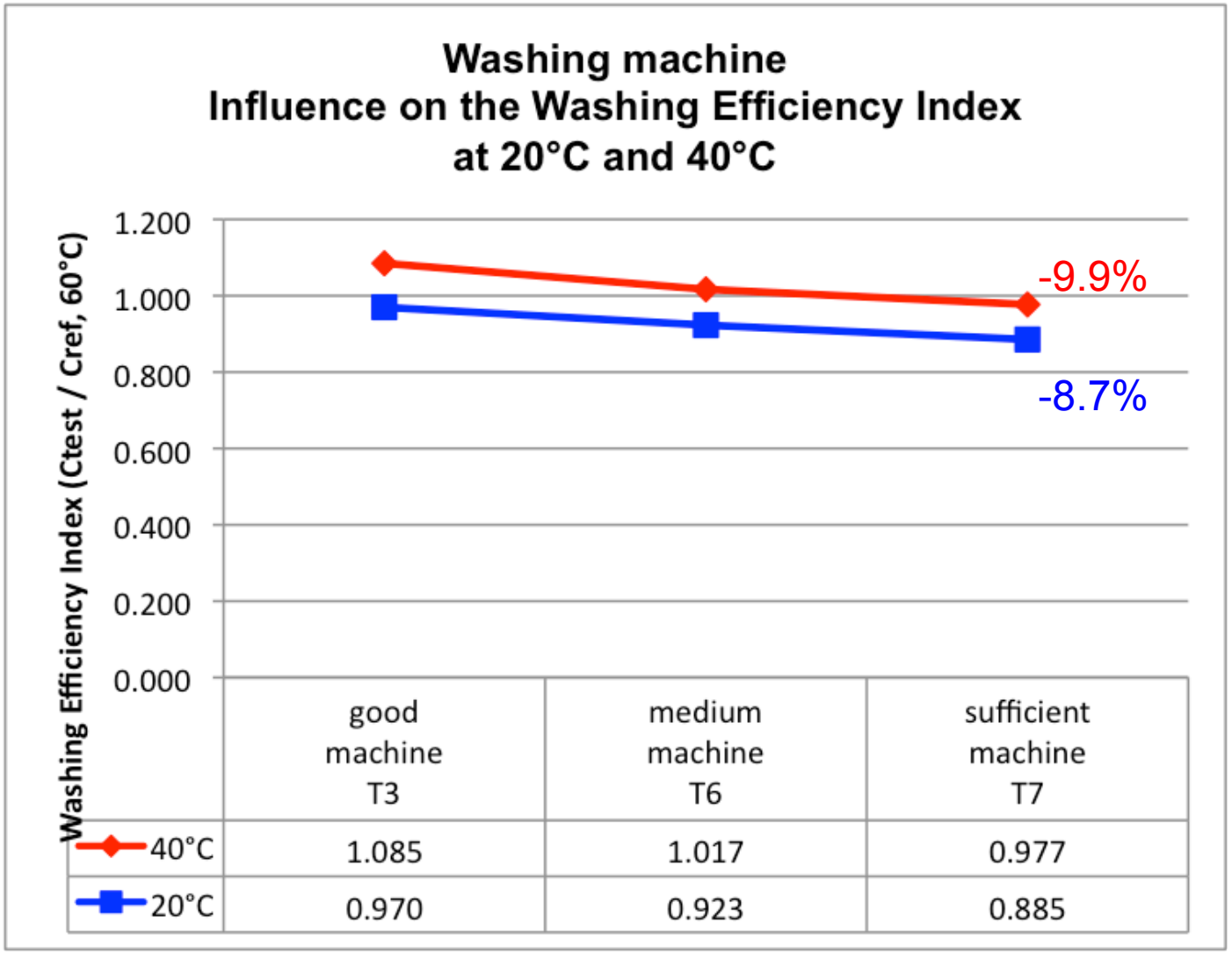
	good detergent T2	medium detergent T3	sufficient detergent T5
40°C	1.109	1.085	1.012
20°C	0.994	0.970	0.918

Washing performance increases with pre-treatment of stains



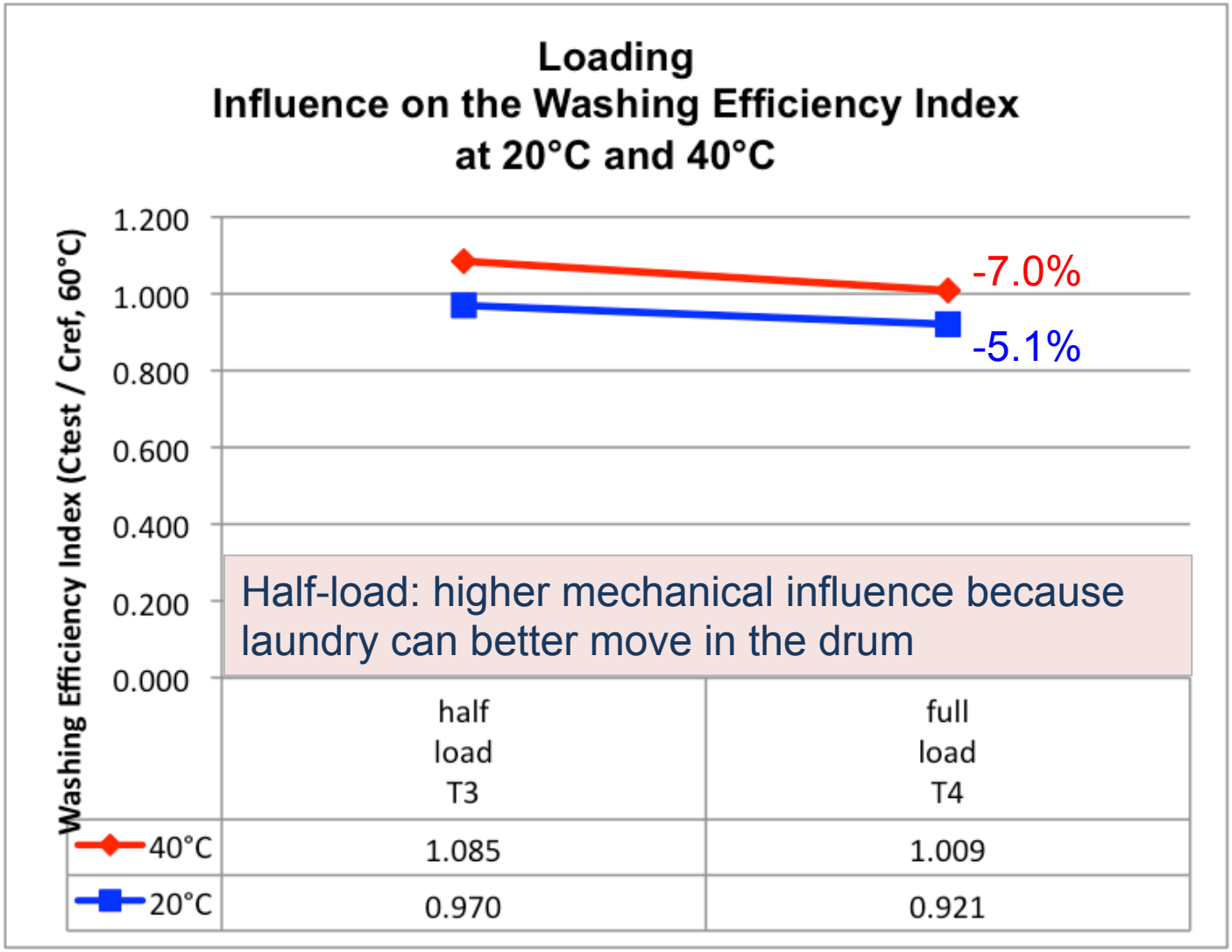
	with soil rem. good det. good mach. T1	no soil rem. good det. good mach. T2	with soil rem. suff. det. suff. mach. T8	no soil rem. suff. det. suff. mach. T9
40°C	1.112	1.109	0.999	0.928
20°C	1.032	0.994	0.896	0.811

Washing performance increases with quality machines



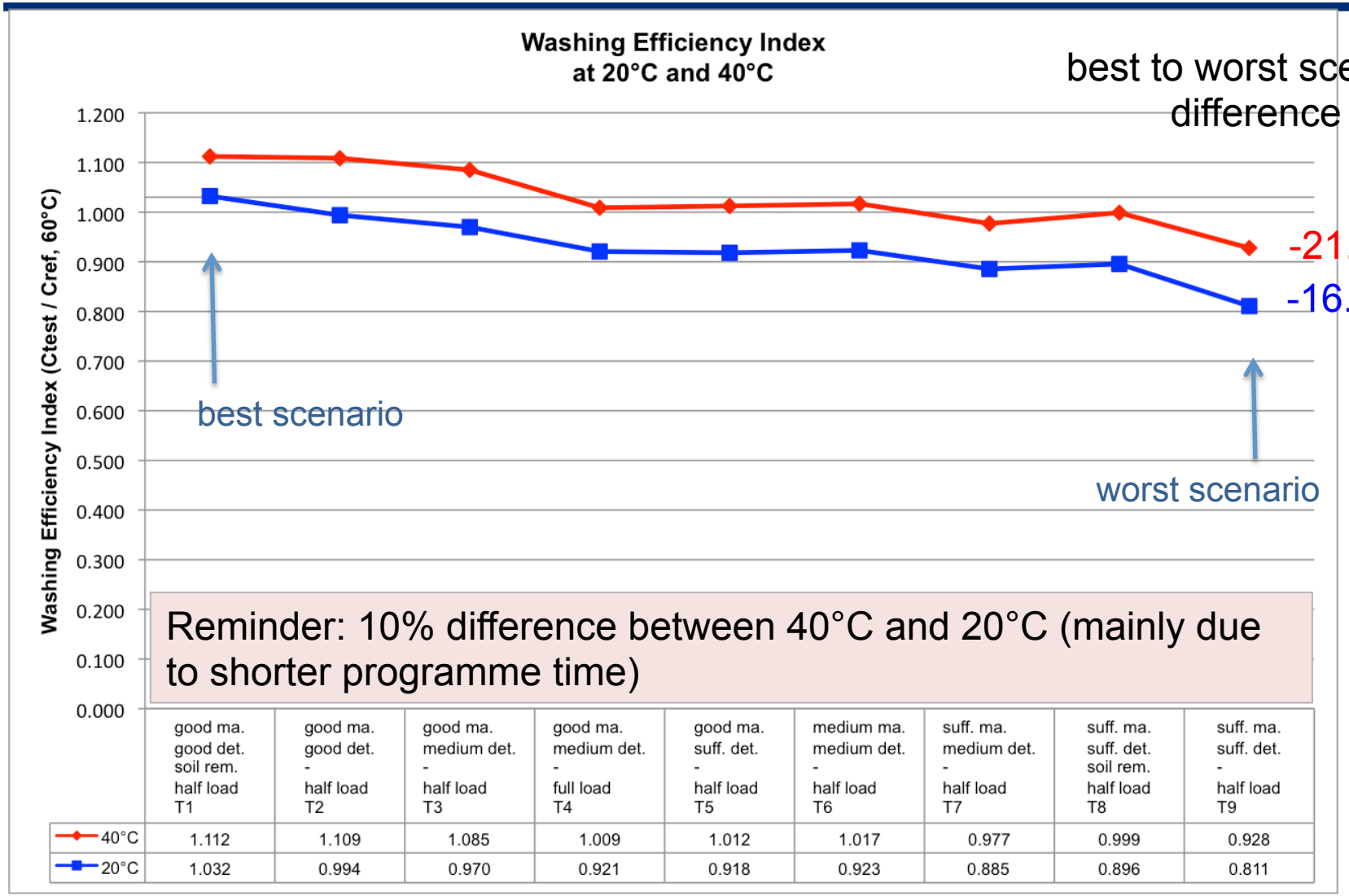
	good machine T3	medium machine T6	sufficient machine T7
40°C	1.085	1.017	0.977
20°C	0.970	0.923	0.885

Washing performance increases when half-loading



	half load T3	full load T4
40°C	1.085	1.009
20°C	0.970	0.921

Impact of cold wash on washing performance is lower than that of other factors



Reminder: 10% difference between 40°C and 20°C (mainly due to shorter programme time)

	good ma. good det. soil rem. - half load T1	good ma. good det. - half load T2	good ma. medium det. - half load T3	good ma. medium det. - full load T4	good ma. suff. det. - half load T5	medium ma. medium det. - half load T6	suff. ma. medium det. - half load T7	suff. ma. suff. det. soil rem. half load T8	suff. ma. suff. det. - half load T9
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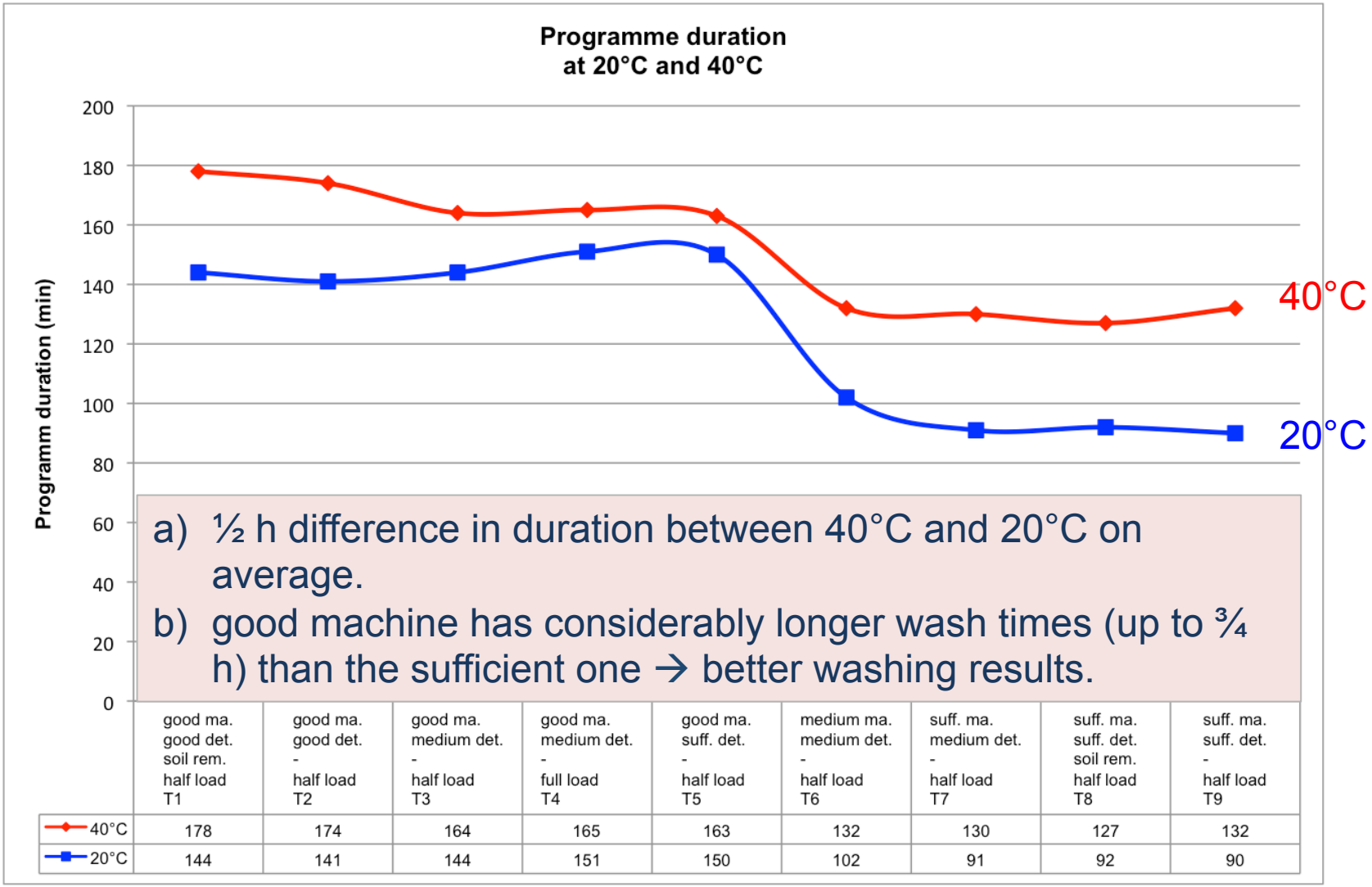
Washing performance is affected by programme duration



a) ½ h difference in duration between 40°C and 20°C on average.

b) good machine has considerably longer wash times (up to ¾ h) than the sufficient one → better washing results.

	good ma. good det. soil rem. - half load T1	good ma. good det. - half load T2	good ma. medium det. - half load T3	good ma. medium det. - full load T4	good ma. suff. det. - half load T5	medium ma. medium det. - half load T6	suff. ma. medium det. - half load T7	suff. ma. suff. det. soil rem. half load T8	suff. ma. suff. det. - half load T9
40°C	178	174	164	165	163	132	130	127	132
20°C	144	141	144	151	150	102	91	92	90

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Summary

- Cold wash (20°C) saves 60% electricity compared to 40°C.
- Temperature just one factor affecting washing performance.
- Good washing performance is reached at 20°C with good machines and detergents.
- Cold wash might be appropriate for most everyday situations. We encourage you to try!

Recommendations

- EU policy-makers
  - Include requirements on the washing efficiency at 20°C in the revision of EU Ecodesign Regulation 1015/2010.

- Washing machine & detergent manufacturers
  - Optimization of machines and detergents for 15°/20°C.
  - Use ‘cold wash compatibility’ as a selling argument.

- Environmental/consumer organisations, energy agencies
  - Continue consumer information/education campaigns on cold wash.

- Academia, research institutes, testing laboratories.
  - Tests and publication of studies (consumer and technical) on cold wash.

Topten flyer «*Washing at 20°C is Cool*»

- Illustrates how to best wash at 20°C

- Download: http://www.topten.eu/uploads/File/Professional/Other%20Pro%20Guidelines/Flyer_Coldwash_2014.pdf

Thank you for your attention

Barbara Josephy	barbara.josephy@topten.eu
Eric Bush	eric.bush@topten.eu
Sophie Attali	sophie.attali@topten.eu
Francisco R. Zuloaga	francisco.zuloaga@topten.eu

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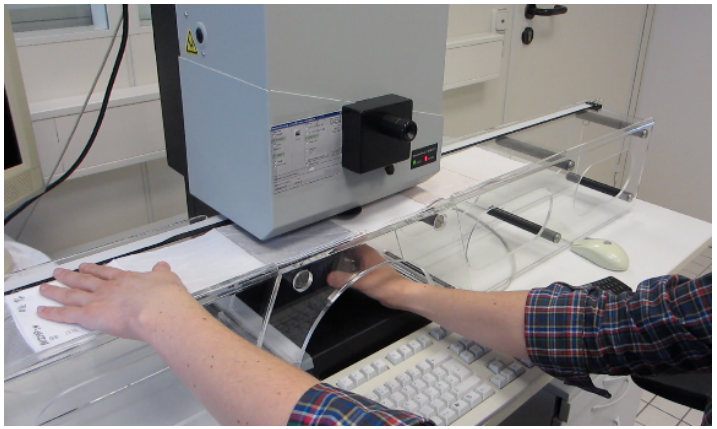
Test arrangement

- Programmes
  - 40°C: «standard programme» as used for the EU Energy label
  - 20°C: programme as required by the Ecodesign Regulation since end 2013 (not for wool etc.)
- Testing at half-load
  - 40°C-standard programme for the EU Energy label is tested at half-load
    → For comparability: also at 20°C was tested at half-load (exception: tests full-load versus half-load)
  - Half-load better reflects real consumer behaviour: the average washing load in European households is assumed to be between 3 kg and 4 kg

Measurements of reflectance

- After washing / drying
  - Reflectance of each of the five soiling was measured and average was derived after the completion of a test cycle
  - The 5 average-values then were summed up to the test strip's total reflectance (in %)



Standard Soiling	Reflectance (%)
1. Sebum / pigment	74.55
2. Mineral oil / black carbon	47.89
3. Blood	86.04
4. Chocolate / milk	75.15
5. Red wine	82.60
Sum Reflectance (%)	***366.23***

Washing Efficiency Index

- Reflectance sum itself does not have an explanatory power on the washing performance
- Relevant for conclusions: Washing Efficiency Index
  - Ratio between the reflectance sum of the test (C_{test}) and the reflectance sum of reference machine (C_{ref})
  - Reference machine: 60°C as also applied by Ecodesign Reg.

Reflectance sum (%) test (C_{test})	366.23
Reflectance sum (%) reference machine ($C_{ref, 60°C}$ *(acc. Reg. 1015/2010)*)	330.37
Washing Efficiency Index (C_{test} / $C_{ref, 60°C}$)	***1.109***

  - All test results were referenced (40; 40 ½; 20; 20 1/2)

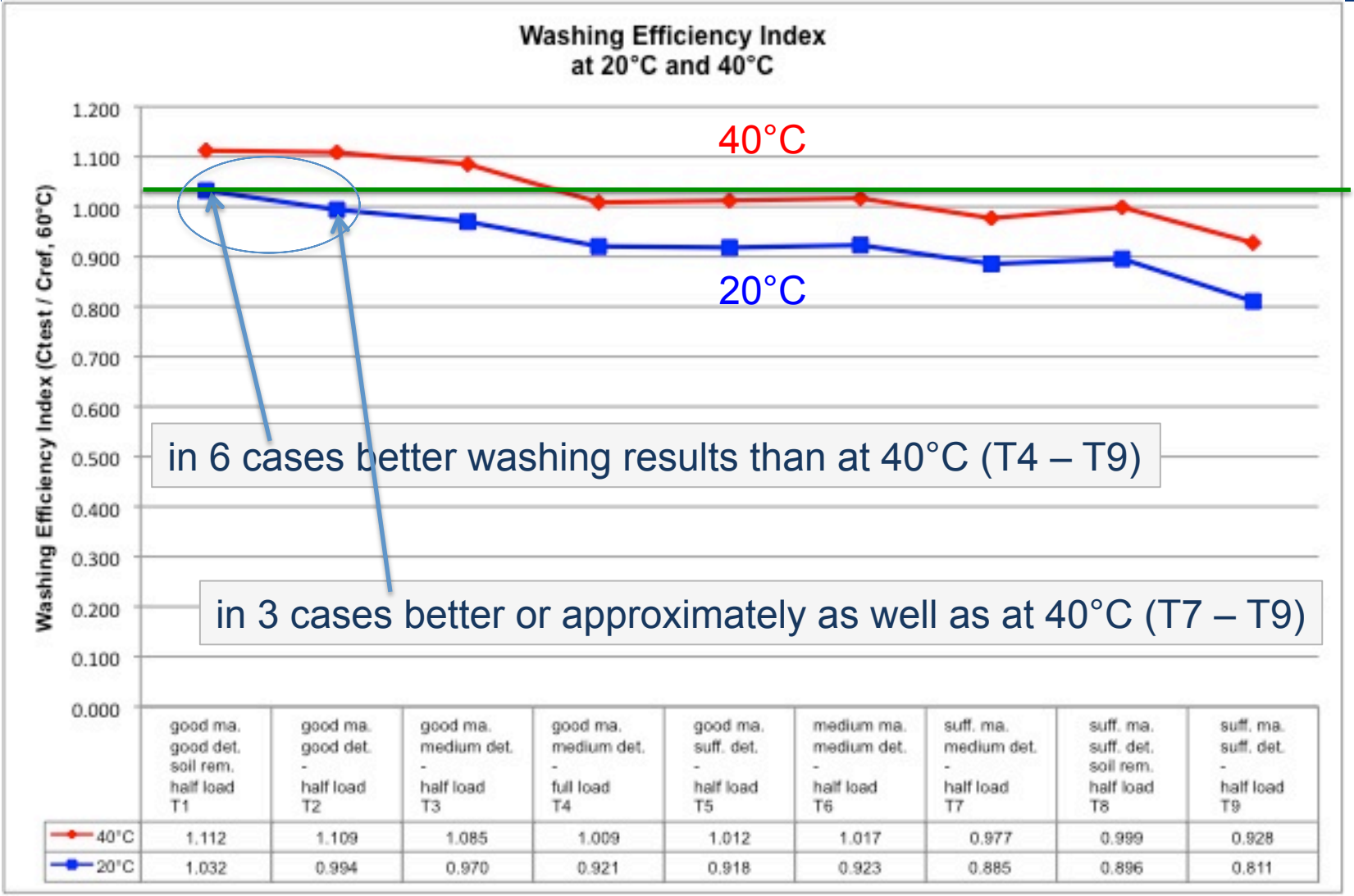
Washing Efficiency Index

- Reference for clean: WEI > 1.03
- > 1.03 = MEPS of Ecodesign Reg. 1015/2010

$$I_W = \frac{(3 \times I_{W,60} + 2 \times I_{W,60½} + 2 \times I_{W,40½})}{7}$$

- How good is this reference value > 1.03 reached at 40°C and at 20°C?

Washing results 20°C can be better than 40°C



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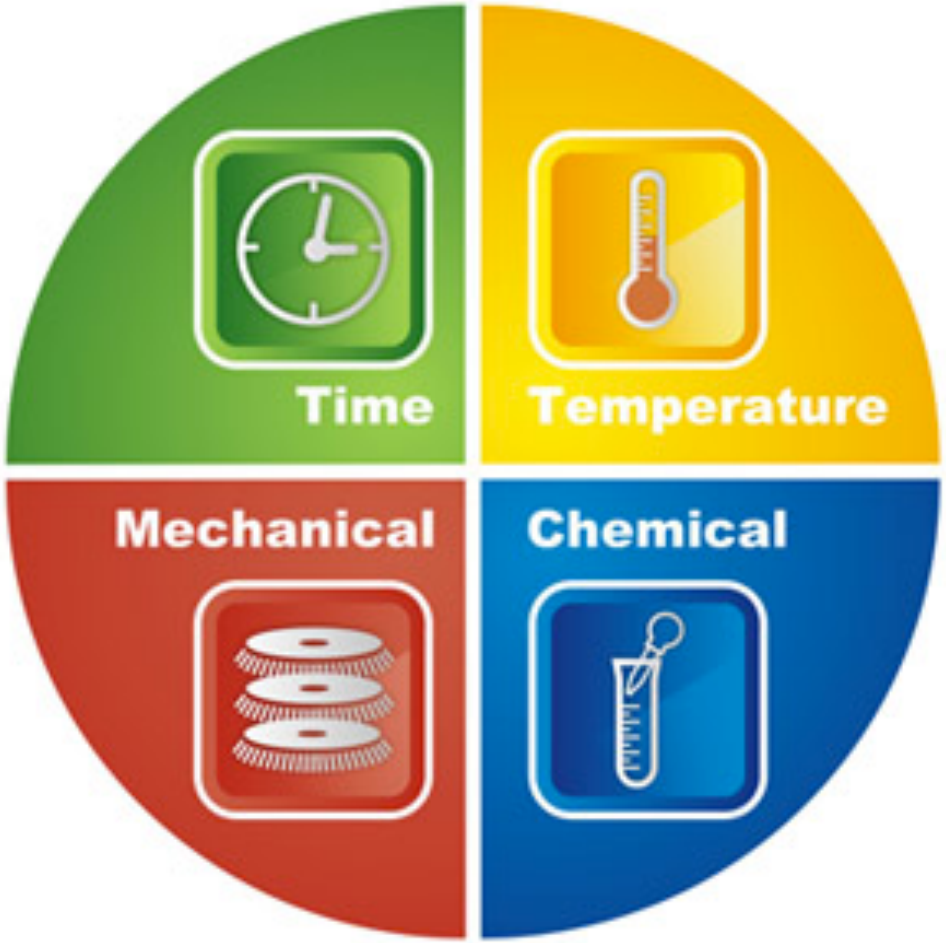
Cold wash is appropriate for normally soiled laundry

- To be kept in mind: tests were carried out with heavily soiled test-laundry.
- However, our everyday clothing are only worn for a few hours or one day and usually are free of stains. They are normally soiled. This type of laundry is the usual case.
- It can be concluded that cold wash is absolutely appropriate for normally soiled laundry.

Sinner Circle

- Four factors influence the washing final result



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Choice of factors

Detergent 3 products good & sufficient: test 11/2014 medium: IEC A*
Pre-treatment of stains 1 product (experts recommendation)
Washing machine 3 models good, medium, sufficient: test 11/2014 reg. washing performance (all A+++, 8 kg)
Loading