

# German and International Cost Indices



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## German and International Cost Indices - Agenda



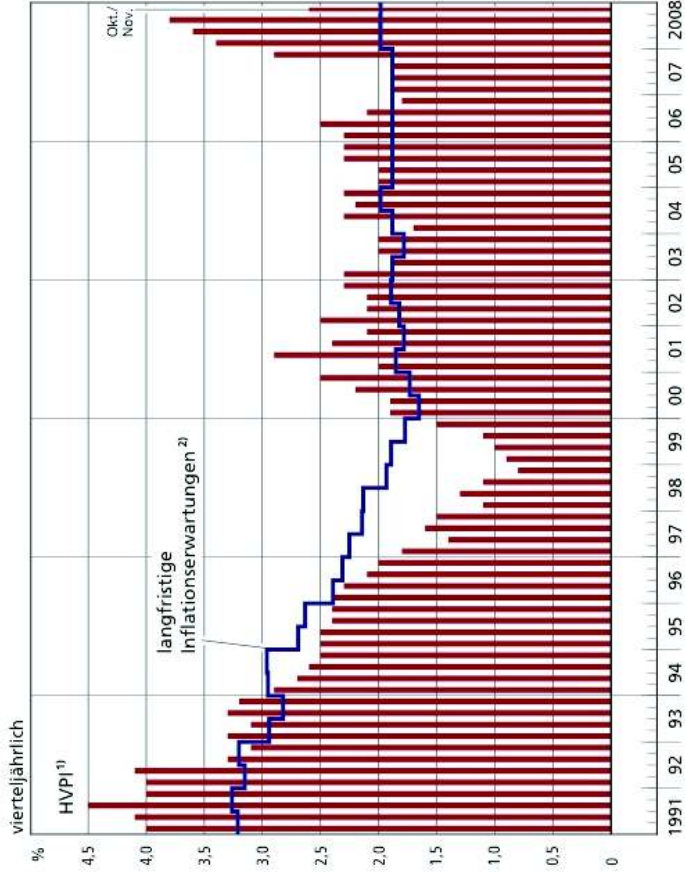
- 1 Purpose of Cost Indices
- 2 Formula for Cost Calculation
- 3 Cost Indices in Germany and USA
- 4 Sources for Cost Indices
- 5 Calculation of Cost Indices
- 6 Strengths, Weaknesses, Opportunities, Threats
- 7 Conclusions
- 8 Recommended Reading

# Inflation Rate and Value of Money

Inflation rate is calculated putting into account a special "basket of commodities"



Inflation in Europe referring to the euro zone



1 Harmonisierter Verbraucherpreisindex, Veränderung gegenüber Vorjahr. — 2 Halbjährliche Umfrageergebnisse von Consensus Economics zur erwarteten Inflationsrate in 6 bis 10 Jahren. Deutsche Bundesbank



Cost Indices are comparable to a specific "inflation rate" with a very special "basket of commodities"

## How are Cost Indices Defined and for What are They Useful?


- Cost Indices are specific cost escalation factors
- They are based on statistical market data and they are specifically estimated for different branches of the process industry, e.g. for the chemical process industry or for the refinery industry
- Cost Indices can be used to up-date fixed capital investment data from
  - 1) former projects, 2) outdated proposals or 3) company in-house data bases
- They are used for the transfer of cost in time of equipment, plant sections or complete plants
- Cost Indices are valid for the estimation of cost over a time span of approximately 10 years, depending upon changes in the state of the art of the respective equipment
- Cost Indices are estimated as overall parameters for
  - 1) an average chemical plant using specific weighting factors and
  - 2) for different sub-groups such as "heat exchangers and tanks", "pipes vessels and fittings", "buildings" or "engineering and supervision", respectively.

## Calculation of Cost from one Point in Time to Another

$$\text{cost today} = \text{cost yesterday} \cdot \left( \frac{\text{index today}}{\text{index yesterday}} \right)$$

### Example

Year	Fix Invest	Cost Index
2004	300 Mio €	444,2
2008	x Mio €	566,1


$$300 \cdot 10^6 \cdot \left( \frac{566,1}{444,2} \right) = 300 \cdot 10^6 \cdot 1,27 = 382 \text{ Mio €}$$

- USA
  - Marshall and Swift equipment cost index
  - Chemical Engineering plant cost index - CEPCI - [www.che.com](http://www.che.com)
  - PEP index, SRI Consulting - [www.sriconsulting.com/](http://www.sriconsulting.com/)
- Germany
  - cost index "Kölbel and Schulze", "Chemie Technik-Index", formerly VCI
  - "Dechema-Index" (in statu nascendi)

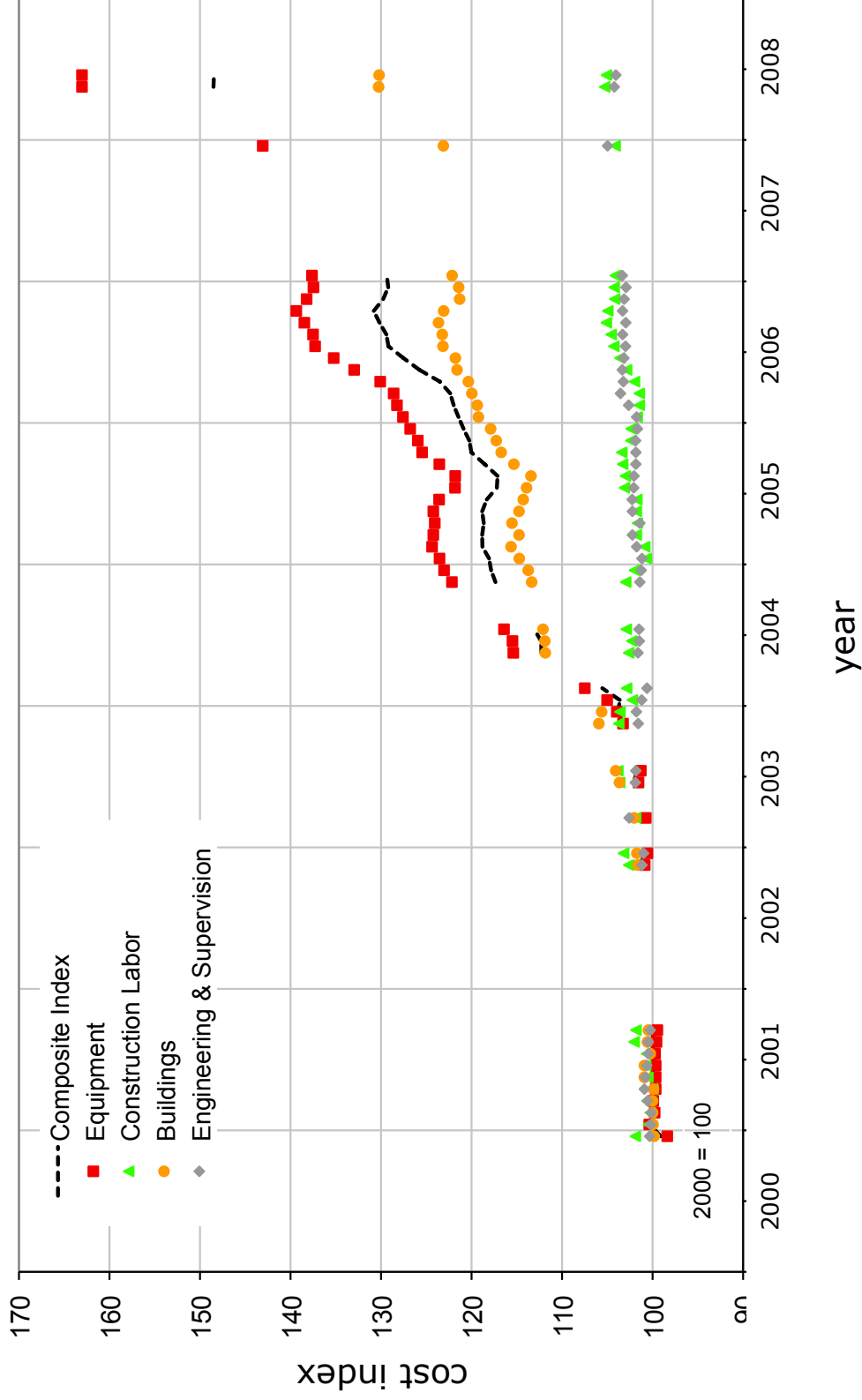
# Cost Indices USA - Yearly Averages

Year	Marshall and Swift installed-equipment indexes, 1926 = 100		Eng. News-Record construction index			Nelson-Farrar refinery construction index, 1946 = 100	Chemical Engineering plant cost index, 1957-1959 = 100
	All industries	Process industry	1913 = 100	1949 = 100	1967 = 100		
1987	814	830	4406	956	410	1121.5	324
1988	852	859.3	4519	980	421	1164.5	343
1989	895	905.6	4615	1001	430	1195.9	355
1990	915.1	929.3	4732	1026	441	1225.7	357.6
1991	930.6	949.9	4835	1049	450	1252.9	361.3
1992	943.1	957.9	4985	1081	464	1277.3	358.2
1993	964.2	971.4	5210	1130	485	1310.8	359.2
1994	993.4	992.8	5408	1173	504	1349.7	368.1
1995	1027.5	1029.0	5471	1187	509	1392.1	381.1
1996	1039.1	1048.5	5620	1219	523	1418.9	381.7
1997	1056.8	1063.7	5825	1264	542	1449.2	386.5
1998	1061.9	1077.1	5920	1284	551	1477.0	389.5
1999	1068.3	1081.9	6060	1315	564	1497.2	390.6
2000	1089.0	1097.7	6221	1350	579	1542.7	394.1
2001	1093.9	1106.9	6342	1376	591	1579.7	394.3
2002	1102.5 <sup>‡</sup>	1116.9 <sup>‡</sup>	6490 <sup>‡</sup>	1408	604 <sup>‡</sup>	1599.2	390.4

2003	402,0
2004	444,2
2005	468,2
2006	499,6
2007	525,4
2008-12	548,4

Peters, M. S.; Timmerhaus, K. D.:  
Plant Design and Economics for Chemical Engineers, McGraw-Hill, New York (2003)

# CEPCI - Composite Index and Subindices



## Weighting within the CEPCI

Subindices		Weighting in Composite Index
Equipment	Material	44,04%
	Labor	6,64%
Buildings	Material	2,42%
	Labor	2,15%
Engineering & Supervision		15,75%
Construction labor		29,00%

Subindices		Weighting within Equipment
Heat exchanger and tanks	Material	33,8%
	Labor	26,2%
Process machinery	Material	7,6%
	Labor	9,9%
Pipes, vessels and fittings		2,9%
		19,0%
Process instruments	Material	10,5%
	Labor	7,9%
Pumps and compressors		2,6%
Electrical equipment		-
Structural supports and miscellaneous		6,4%
		7,0%
		10,5%

data from:  
Vatavuk, W.M.; Updating the CE Plant Cost Index,  
*Chemical Engineering* **109** (1), 2002, pp. 62–70



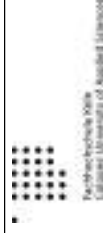
## Chemical Engineering Plant Cost Index - Subindices



	<b>Dec 08</b>	<b>Nov 08</b>	<b>Oct 08</b>	<b>May 08</b>	<b>Sep 05</b>
<b>CE plant cost index</b>	<b>548,4</b>	<b>566,2</b>	<b>592,2</b>	<b>583,9</b>	<b>467,2</b>
Equipment	654,4	681,3	720,0	710,3	541,2
Heat exchangers & tanks	618,3	655,8	711,7	712,4	509,2
Process machinery	623,2	641,0	664,7	644,3	521,7
Pipes, valves & fittings	806,1	831,8	864,0	835,6	620,8
Process instruments	397,0	415,6	439,0	445,6	379,5
Pumps & compressors	891,3	896,5	893,0	862,1	756,3
Electrical equipment	459,7	461,7	471,9	453,8	374,6
Structural supports & misc.	684,0	718,0	771,8	770,6	579,3
Construction labour	328,3	326,4	326,3	319,7	309,1
Buildings	503,6	514,0	522,7	504,8	444,7
Engineering & supervision	349,9	350,6	351,3	353,7	346,9

Source: Chemical Engineering

# Chemcad and the Chemical Engineering Plant Cost Index

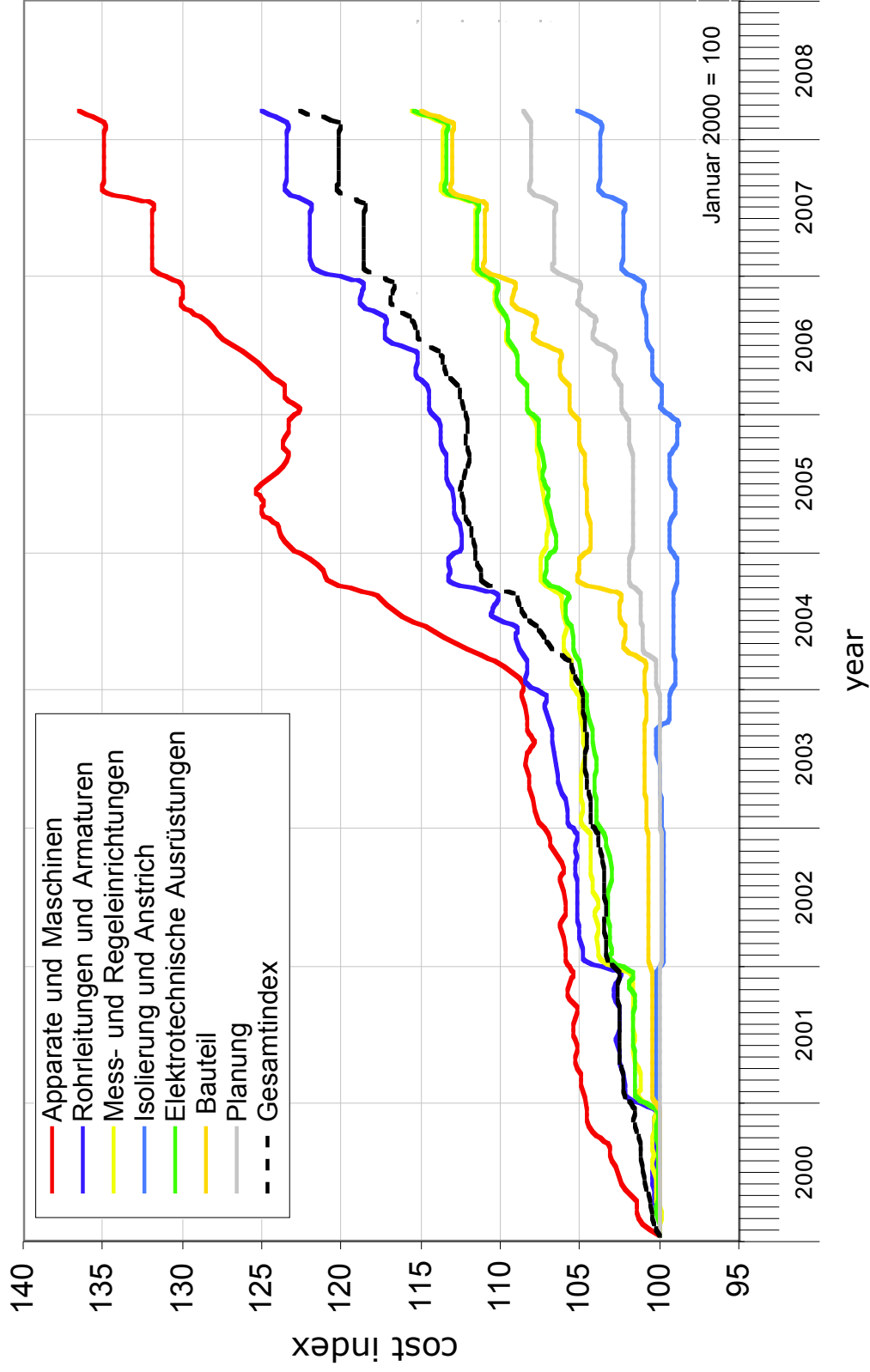
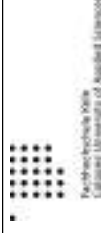


Year/month for the cost index:  
Year: 2007  
Month: December

Type	Cost Index
CE INDEX	524.9
Equipment	623.3
Heat exchangers and tanks	500.6
Process machinery	537.9
Pipe, valves, and fittings	727.2
Process instruments	414.3
Pump and compressors	840
Electrical equipment	436.3
Structural supports and misc.	650.8
Construction labor	316.2
Buildings	477.1
Engineering and supervision	356.2

www.chemstations.net

# Chemie Technik - CT-Index and Subindices



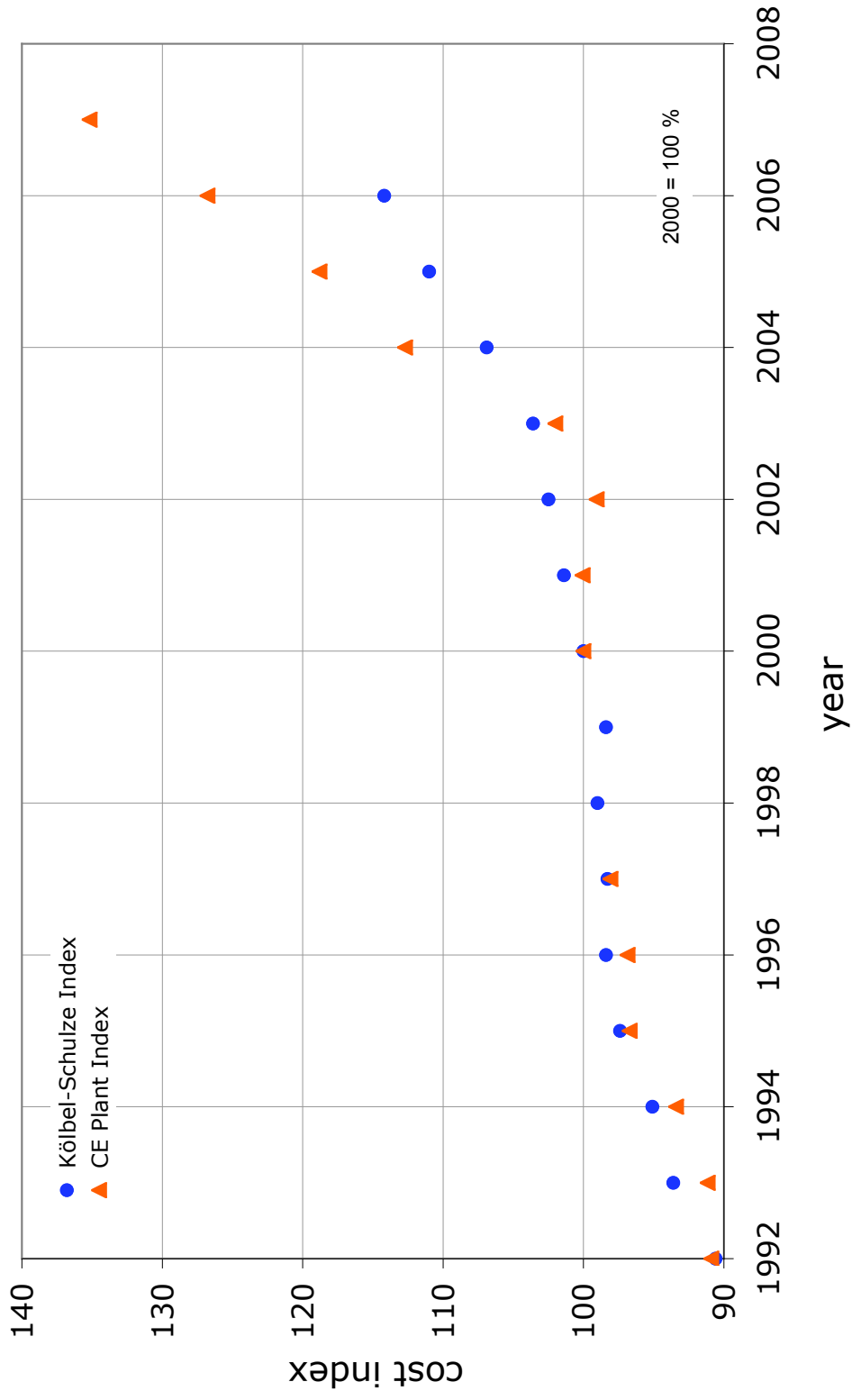
# Structure of CT-Index - Chemie Technik

Bezeichnung Einzelindex	GP-Systematik	Promille im Erzeugerpreisindex	Wichtigkeit im CT-Index	Wichtigkeit Hauptkomponente	Bezeichnung Hauptkomponente	Wichtigkeit im CT-Index
Dampfkessel f.d. Heißwasser- u. Niederdruckdampfherzeugung	GP - 283	0,98	3,6%	60%	Apparate und Maschinen	33%
Rohre	GP - 272	4,41	16,2%			
Verfahrenstechn. Maschinen und Apparate	GP - X29006	-	13,2%	40%		
Armaturen	GP - 2913	-	8,0%	50%	Rohrleitungen und Armaturen	16%
Gas-Wasser-Abwasserinstallation in Gebäuden	-	-	8,0%	50%		
Mess-Kontroll- u. ähnl. Instrumente u. Vorrichtungen	GP - 332	-	4,5%	50%	Mess- und Regeleinrichtungen	9%
Nieder- und Mittelspannungsanlagen	-	-	4,5%	50%		
Malen und Lackierarbeiten	-	-	2,5%	50%	Isolierung und Anstrich	5%
Korrosionsschutzarbeiten an Stahl und Aluminium	-	-	2,5%	50%		
Elektr. Geräte z. Schließen, Unterbrechen, Schützen oder Verbinden v. elektr. Stromkreisen f. e. Spannung v. 1000 V oder weniger	GP - 31202	8,97	2,2%			
Tafeln, Felder, Konsolen, Pulte, Schränke zum elektr. Schalten oder Steuern oder für die Stromverteilung f. e. Spannung v. 1000 V oder mehr	GP- 31203	5,29	1,3%	50%	Elektrotechnische Ausrüstungen	7%
Nieder und Mittelspannungsanlagen	-	-	3,5%	50%		
Gewerbliche Betriebsgebäude insgesamt	-	-	15,0%	100%	Bauteil	15%
Architektenleistung	-	-	15,0%	100%	Planung	15%

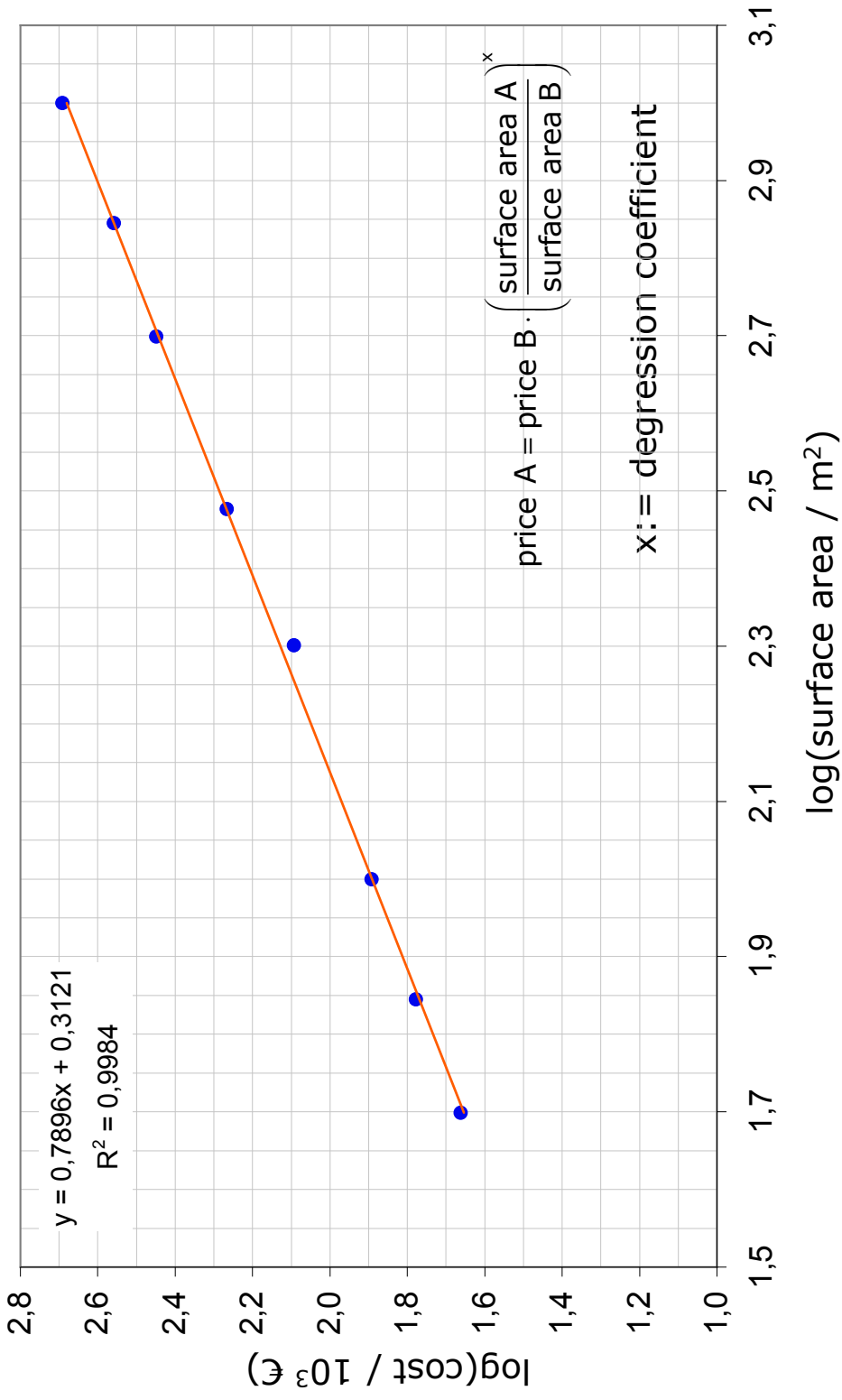
www-genesis.destatis.de

data from Rösner, A., diploma thesis FH-Köln (2007)

## Cost Indices – CEPCI (USA) vs. Kölbel-Schulze (D)



# Data for Estimation of Cost Indices - a Self-fulfilling Prophecy?



data taken from DACE-prijzenboekje, [www.dace.nl](http://www.dace.nl)

## Strengths, Weaknesses, Opportunities and Threats

### Strengths

- fast and easy estimation of time impact on cost
- due to a globalized economy of the chemical process industry is (or was?) cost escalation in Europe similar to that in the US

### Weaknesses

- "we are driving a fast pace and are looking into the back mirror"
- composite index → is your plant really an average plant?
- the statistical data base is not always adequately chosen

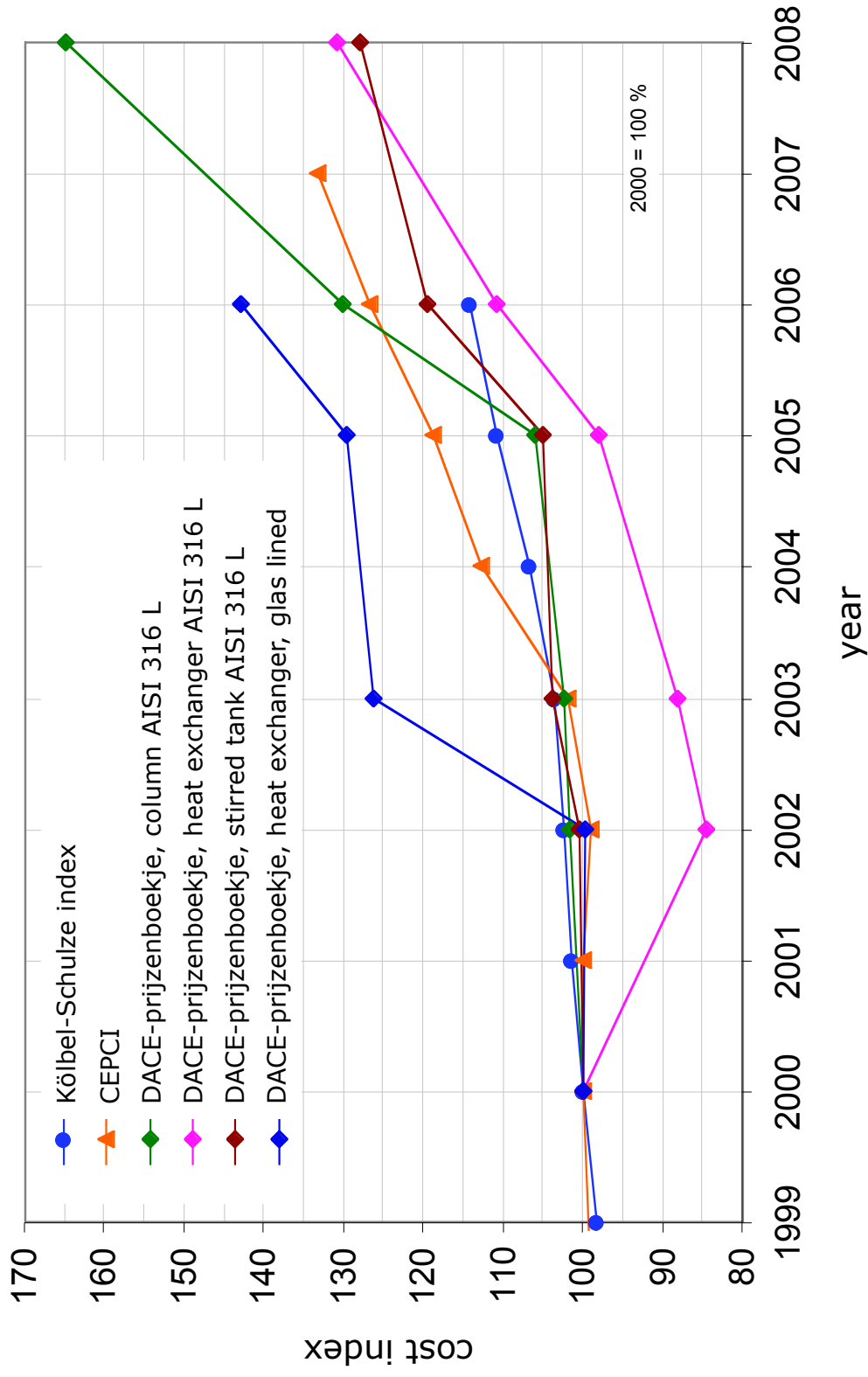
### Opportunities

- all necessary data are collected by national statistical bureaus, they "just" need to be processed in the right way and published a.s.a.p.

### Threats

- the impact of productivity on cost escalation is significant
- and productivity is a catchy estimate

## Different Individual Cost Indices



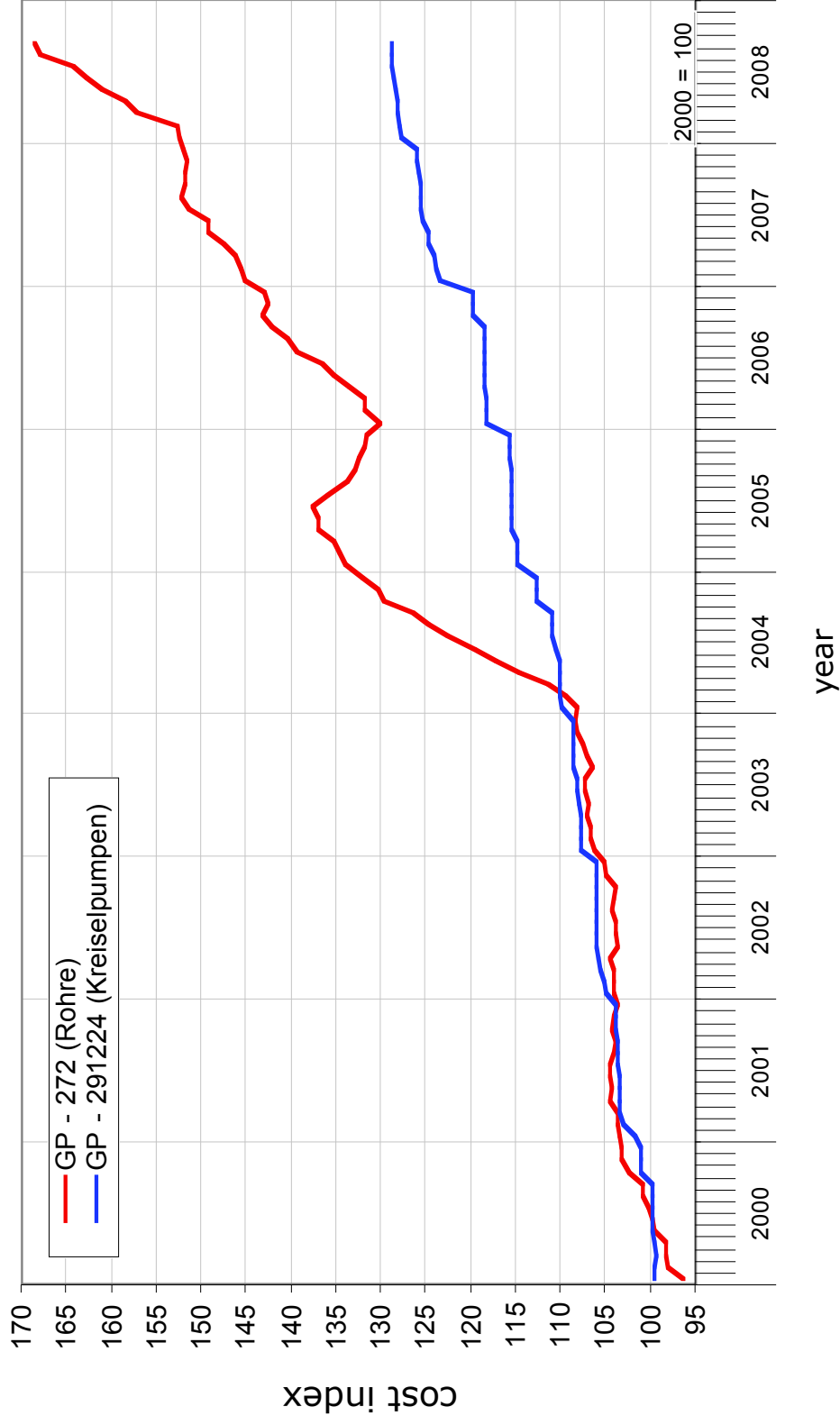
data taken from DACE-prijzenboekje, [www.dace.nl](http://www.dace.nl)



## A Path to a New German Cost Index

- reliable method
- transparent method - "take a look inside"
- reliable statistical data - German Federal Bureau of Statistics
- correctly weighted
- productivity index for the chemical process industry included
- weighting for percentage of CS and SS materials
- free of charge
- maintained by experts e.g. from DECHEMA
- coming soon ...

# Indices taken from German „Erzeugerpreisindex“



# meps - EU Stainless steel Prices



**meps** Subscriptions MEPS World Steel Prices MEPS Steel Reports On-line MEPS News LI

Other MEPS Steel Prices & Indices

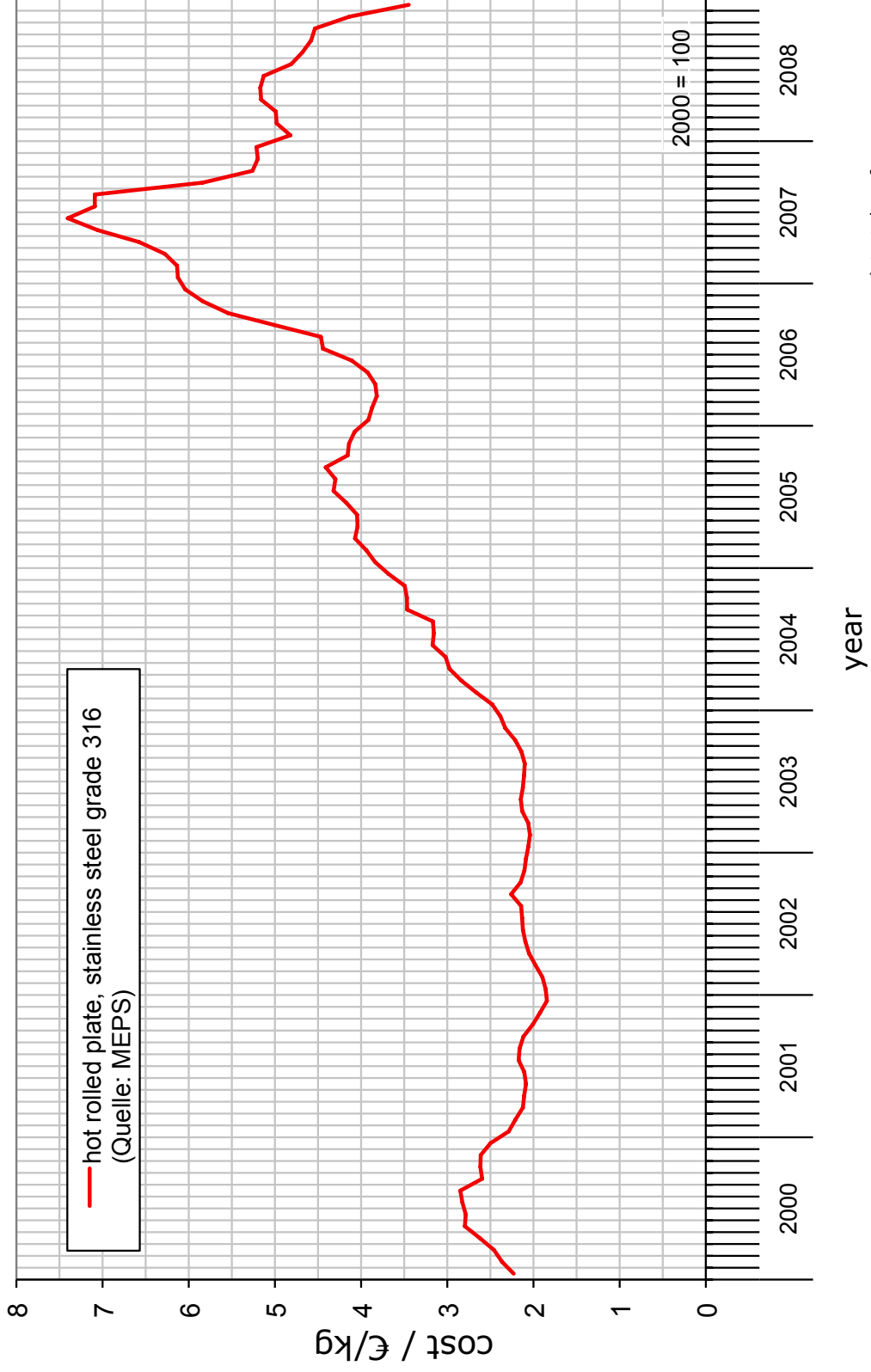
## MEPS - EU STAINLESS STEEL PRICES (Euro/tonne)

All tables are updated monthly.

Date	Hot Rolled Coil			Hot Rolled Plate			Cold Rolled Coil			Drawn Bar		
	Grade 304	Grade 316	Grade 304	Grade 316	Grade 304	Grade 316	Grade 304	Grade 316	Grade 304	Grade 316	Grade 304	Grade 316
Oct-07	2626	4623	3385	5260	2784	4765	3715	3473	3526	5764	5537	6321
Nov	2613	4580	3283	5199	2765	4711	3473	3526	5764	5537	6321	5989
Dec	2696	4660	3288	5214	2851	4799	3526	3230	3244	3230	3230	6024
Jan-08	2533	4351	3017	4821	2686	4490	3355	3230	3244	3230	3230	5764
Feb	2657	4532	3094	4978	2814	4680	3230	3244	3244	3244	3244	5537
Mar	2672	4534	3108	4991	2831	4682	3244	3244	3244	3244	3244	5625
Apr	2844	4726	3270	5163	2999	4876	3353	3353	3353	3353	3353	5718
May	2904	4736	3319	5169	3060	4886	3414	3414	3414	3414	3414	5768
Jun	2890	4663	3338	5133	3046	4815	3440	3440	3440	3440	3440	5750
Jul	2599	4310	3077	4813	2731	4440	3376	3376	3376	3376	3376	5742
Aug	2506	4177	2984	4681	2638	4307	3133	3133	3133	3133	3133	5387
Sep	2299	3986	2887	4580	2443	4132	3119	3119	3119	3119	3119	5492
Oct	2316	4015	2823	4536	2461	4163	3086	3086	3086	3086	3086	5480
Nov	1997	3631	2498	4135	2140	3776	2935	2935	2935	2935	2935	5248
Dec	1772	2841	2274	3447	1914	2884	2588	2588	2588	2588	2588	4556

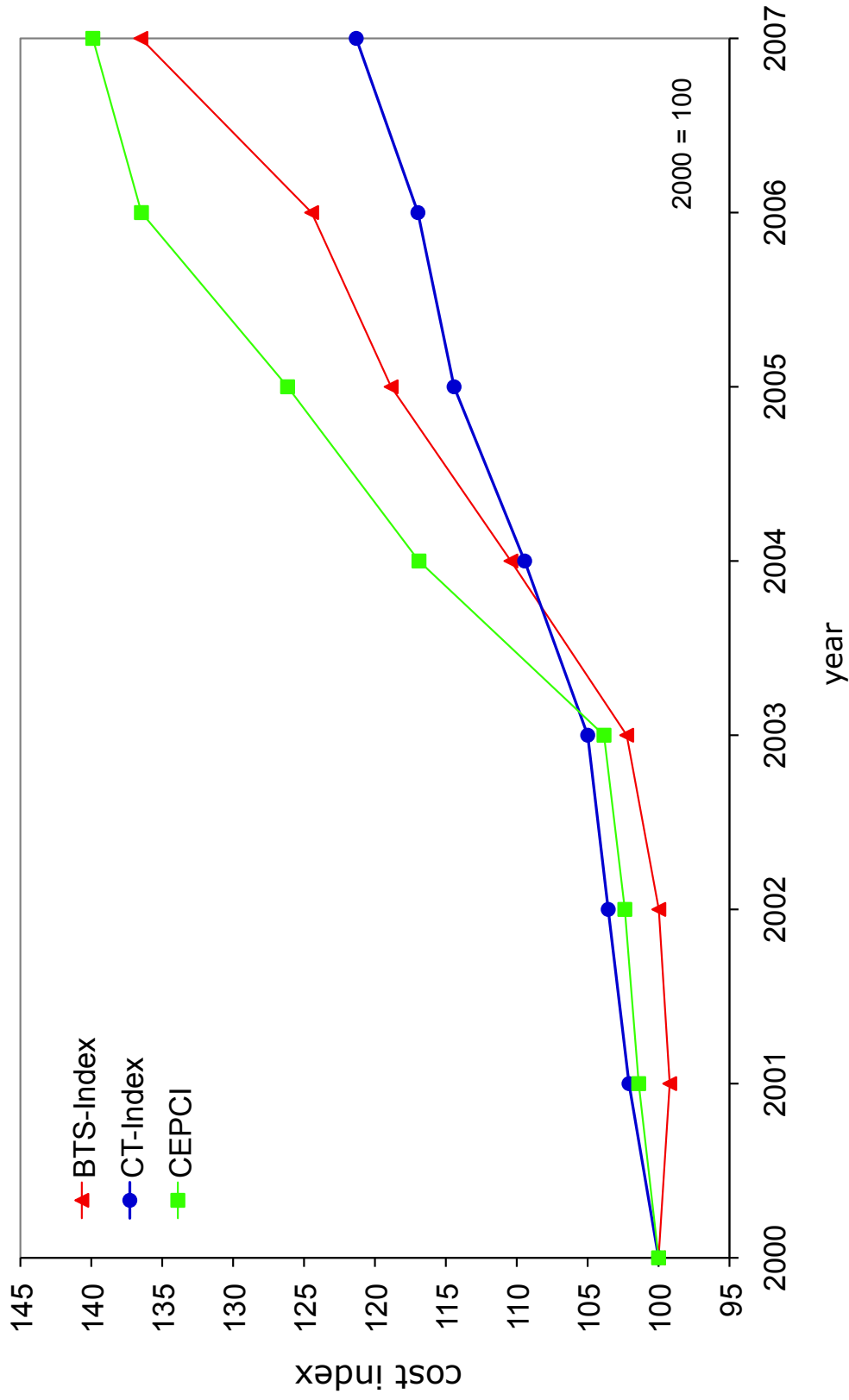
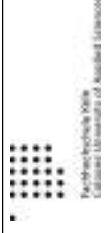
www.meps.co.uk

# Specific Cost Chart - Stainless Steel, Hot Rolled Plate



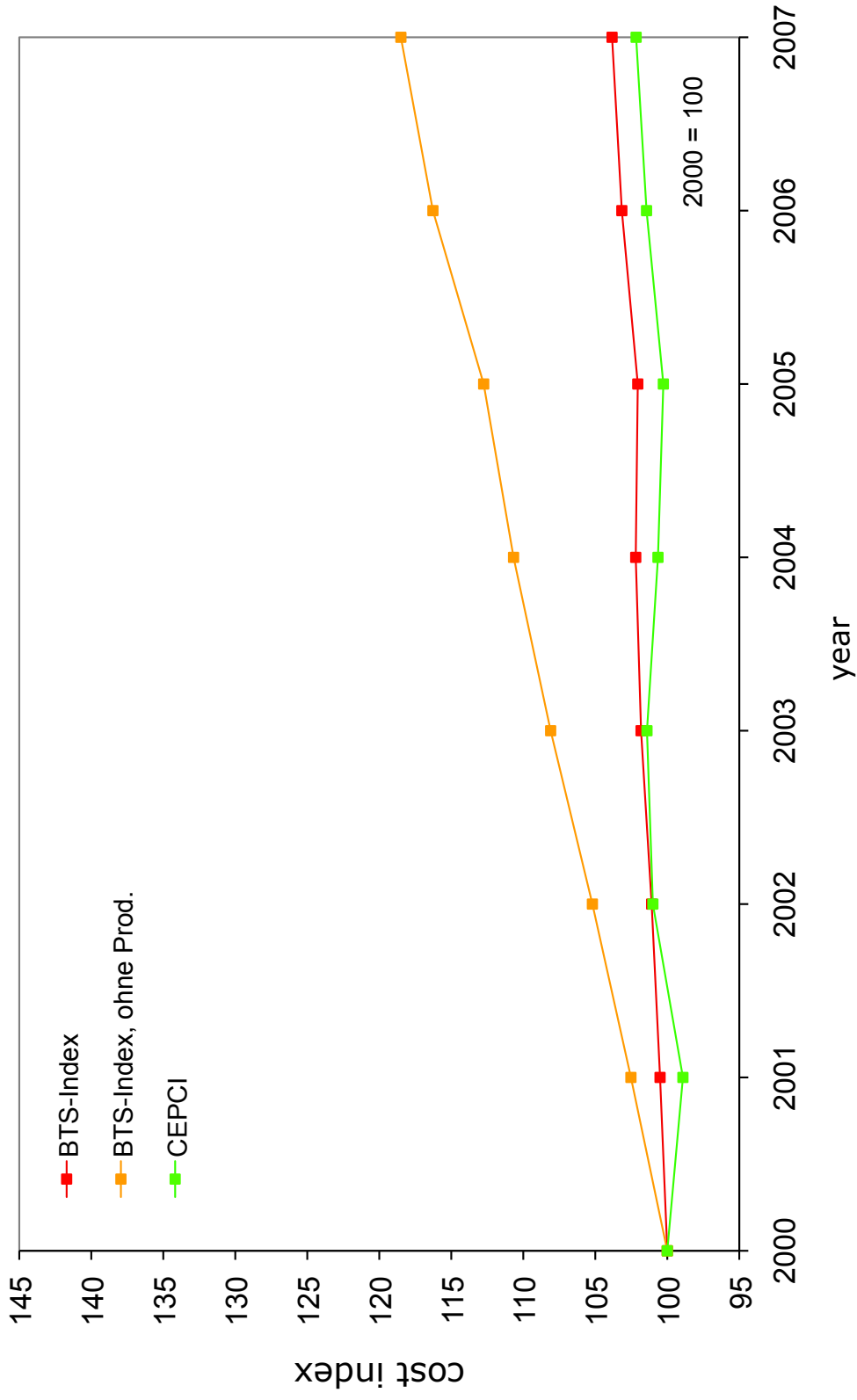
data taken from: [www.meps.co.uk](http://www.meps.co.uk)

# A New German Cost Index - Equipment Cost



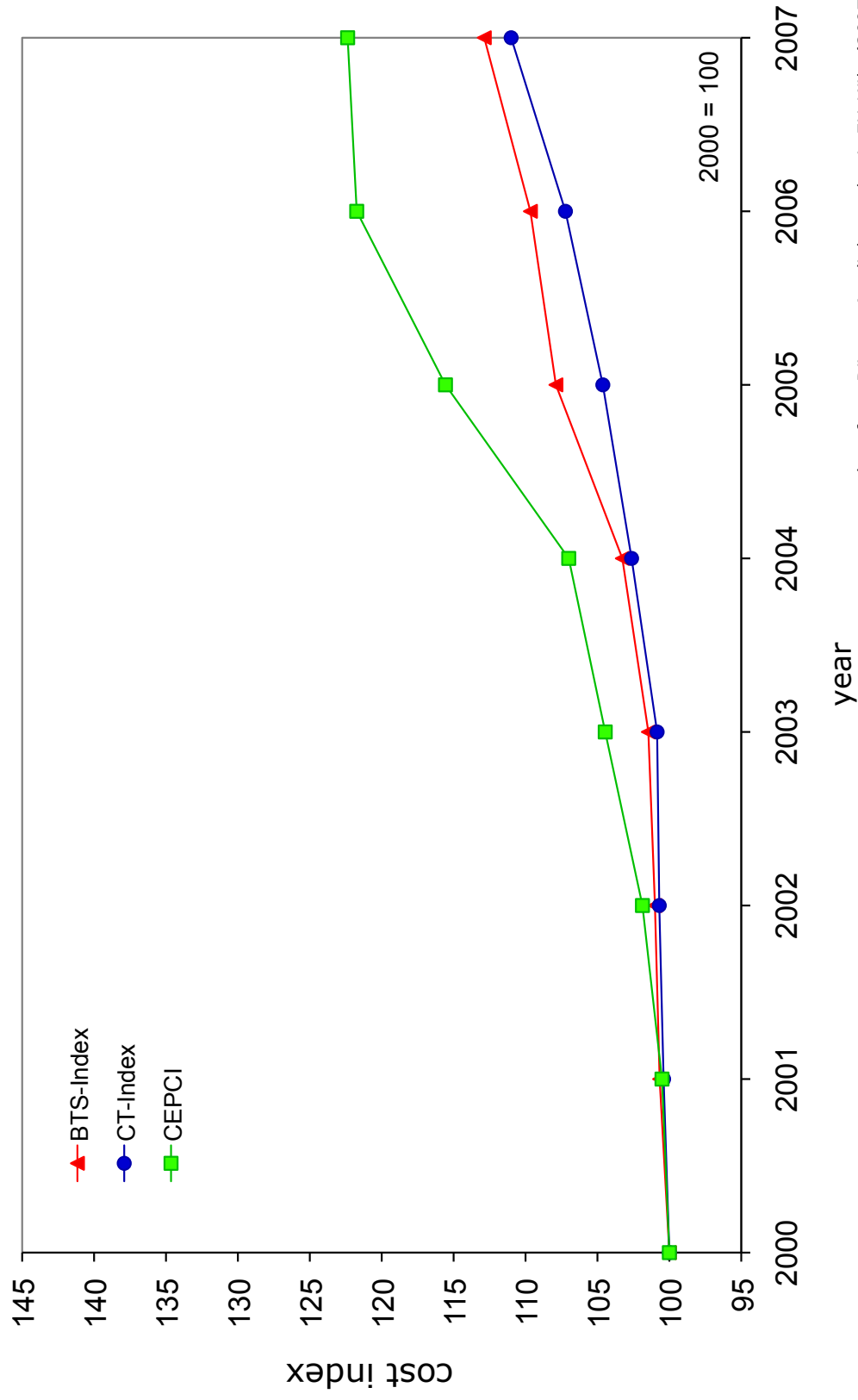
data from Rösner, A., diploma thesis FH-Köln (2007)

# A New German Cost Index - Engineering Cost



data from Rösner, A., diploma thesis FH-Köln (2007)

# A New German Cost Index - Construction Cost



data from Rösner, A., diploma thesis FH-Köln (2007)

## Conclusions

- Cost Indices need to be maintained and up-dated on a regular basis.
- This procedure is essential because the parts of an average chemical plant alter together with the software tools, the work organization and the productivity of the involved engineers.
- One of the most widespread and reliable Cost Indices is the Chemical Engineering Plant Cost Index (CEPCI), which is published monthly by the magazine Chemical Engineering.
- If cost escalation factors are needed for specific equipment or "non-average" plants, it is recommended to calculate the specific Cost Indices using either data published by the respective national statistical bureau (which are easily accessible via internet, e.g. for Germany at [www-genesis.destatis.de](http://www-genesis.destatis.de)) or from data published in the DACE-prijzenboekje, which is updated regularly.
- Accurately estimated Cost Indices which are valid for the respective place and time are essential for engineering companies and producers.
- Since 2003, equipment cost in the chemical process industry has changed rapidly with different trends in the US and Europe on one hand and in China, South East Asia and Japan on the other hand.



## Recommended Reading



- Peters, M.S.; Timmerhaus, K.D.; West. R.E.:  
Plant Design and Economics for Chemical Engineers,  
5<sup>th</sup> Ed, McGraw-Hill (2003)
- Humphreys, K. K.:  
Project and Cost Engineers Handbook,  
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Planning, Estimating and Control of Chemical Construction Projects,  
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Guide to Capital Cost Estimating,  
ICChemE (2000)
- Page, J.S.:  
Conceptual Cost Estimating Manual,  
Gulf Professional Publishing (1996)
- DACE-prijzenboekje, [www.dace.nl](http://www.dace.nl)