FOUNDRYBENCH

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Foundry Energy Efficiency

ENERGY EFFICIENT FOUNDRY OPERATION

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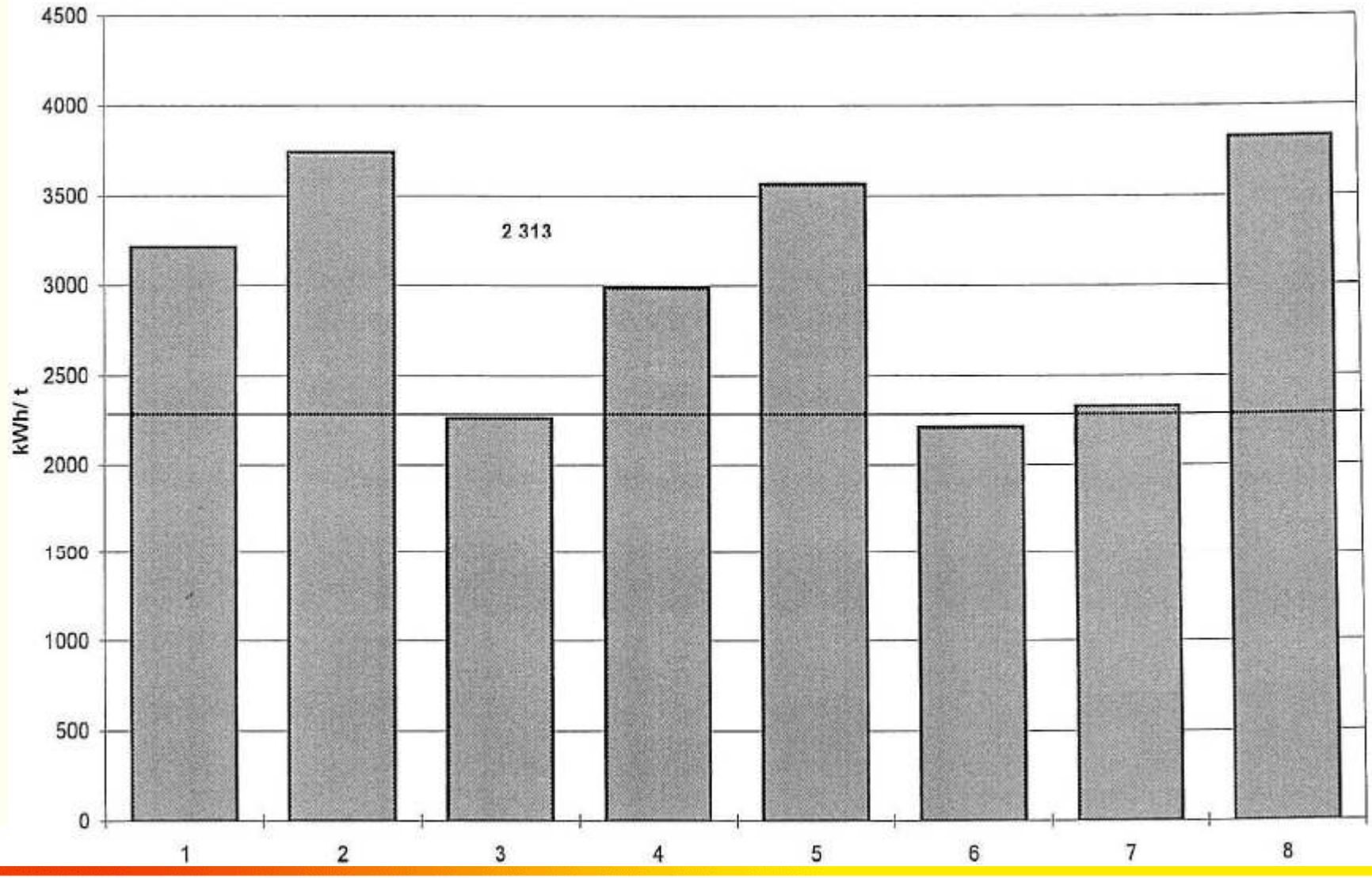
Energy use & costs in foundries (initial data)

Measure	Unit	Iron foundry	Steel foundry	Metal foundry
Energy/ton	MWh/t	2.3	5.0	6.0
En. cost of business v.	%	3 – 6	5 – 10	3 – 6

Nominal energy consumption of the 8 iron foundries studied



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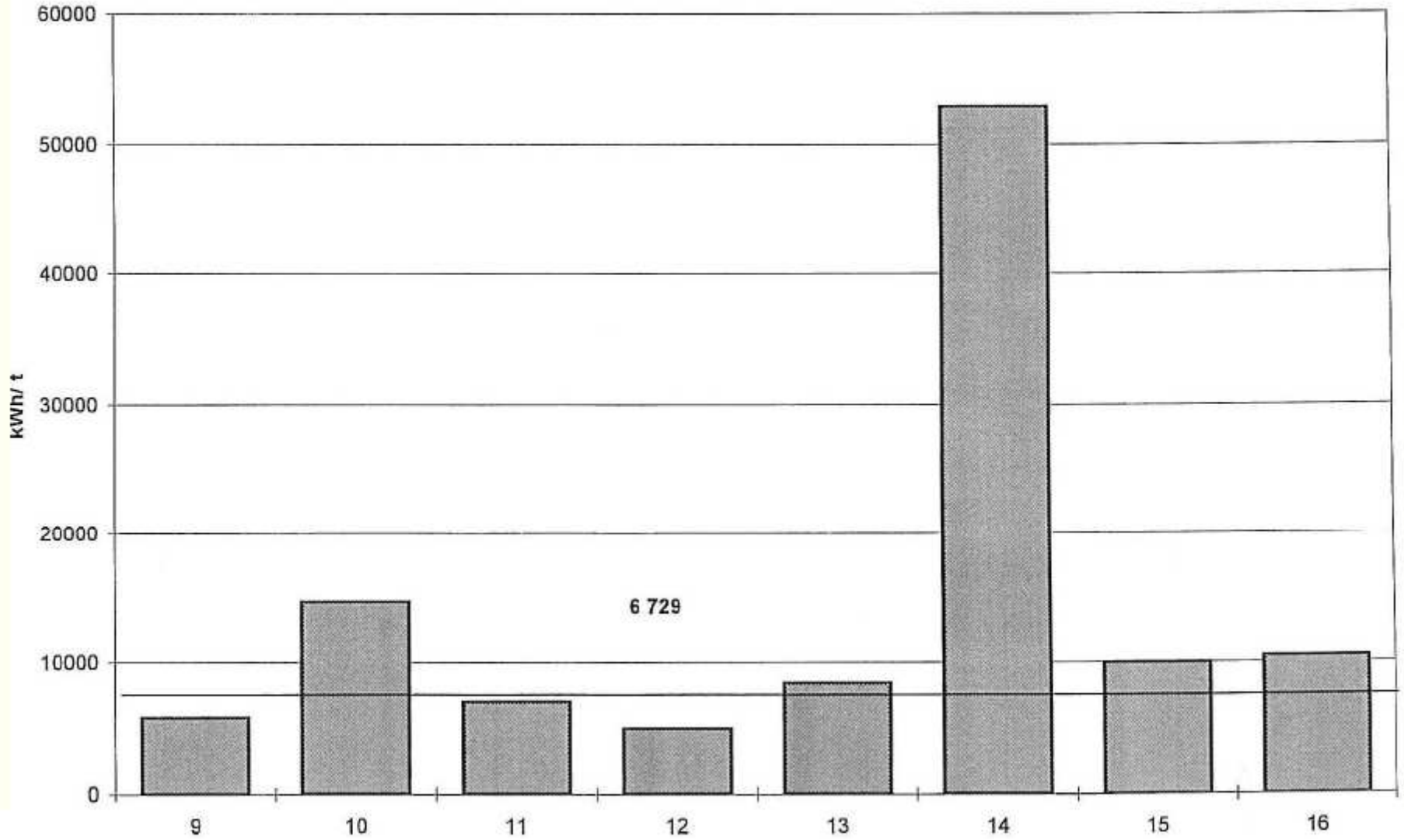
Nominal energy consumption of 8 steel foundries studied



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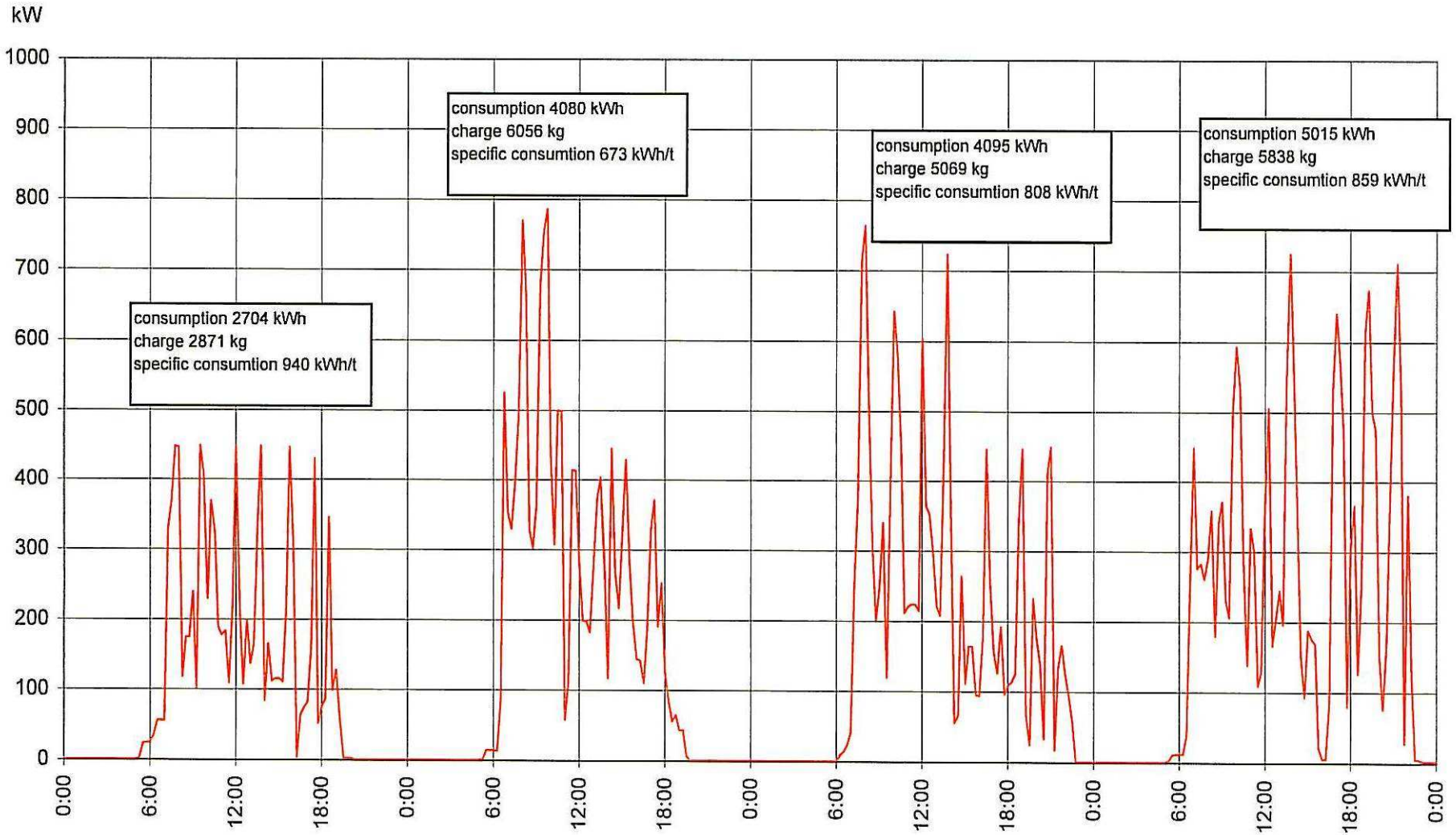
Melting optimization; Induction furnace energy consumption



Energy saving options (initial data)

Object of energy use	Share of tot. energy use, % (iron)	Share of tot. energy use, % (steel)	Potential saving, %	
Melting	40	30	5	
Annealing (steel)		29	3	
Drives	15	10	2	
Pneumatic air	10	7	2	
Laddle preheating	5	5	2	
Ventilation	20	13	6	
Heating	5	3	1	
Lighting	5	3	1	

ENERGY EFFECTIVE FOUNDRY OPERATION 1/5

STATEMENT:

POOR ENERGY EFFICIENCY IN FOUNDRIES COMES MAINLY FROM WRONG MANAGEMENT SYSTEMS NOT SO MUCH FROM INEFFECTIVE TECHNOLOGY

CONCLUSIONS ABOUT THE PREVIOUS SLIDES:

A.Most energy in a foundry is used in

melting,	30 – 40 %	
ventilation	13 – 20 %	
pneumatic air	7 – 10 %	
drives and	10 – 15 %	
heat treatment		29 %
in steel foundries		

B. Variation between foundries is huge – 50 – 1000 %

In melting 650 kWh/t – 950 kWh
Total 2300 – 3750 kWh/t in iron foundries.
Total 6700 – 52.000 kWh/t in steel foundries !

Even in same foundry variation between year is 50 %

C.Energy efficiency is a good indicator about overall efficiency

D.We cannot effect very much the share of energy usage as in A. , but we can affect the absolute level of all usage areas by more professional management

Except Heat treatment as much as melting in steel foundry !

ENERGY EFFECTIVE FOUNDRY OPERATION 2/5

ROOTH CAUSES:

POOR ENERGY EFFICIENCY IN FOUNDRIES COMES MAINLY FROM WRONG MANAGEMENT SYSTEMS

1.POOR DENSITY OF OPERATIONS

Big part of energy is such base energy, which is used on/off

- when the foundry is in open – ventilation is on
- when the furnace is on - it keeps melt warm
- when machines have been started - compressed air is on
- when machines have been started - drives are on
- when heat treatment is planned to use – oven is on

All this is independent on volume and continuity of operations !

Latent base energy consumption can be above 30 % of total energy – this is waste.

To stop this waste is to run foundry on/off, but 100 % effective when it is on !

ENERGY EFFECTIVE FOUNDRY OPERATION 3/5

2. WRONG SCHEDULING OF OPERATIONS
- Melting starts at the beginning of the shift although melt is needed later - Causes also quality problen and scrap = waste
- Heat treatment furnace is hot waiting for a charge
- Only few people in a shift in one department, but ventilation ,however, in full volume
- Cores made too early –occupies the foor and transporters
- Compressed air on all the time bu full effect – no automatization

3. LOW OPERATING HOURS PER DAY, WEEK AND A YEAR
- A plant operating less than 50 % of annual hours is a store not a manufacturing factory !
- Only one shift operation – only 5 days a week - only 225 days/a i45 weeks x 40 hours is 1800 h/a – a year is 8760 hours !
- At least the foundry should work by 100 % speed, when it is on

4. OVER DIMENSIONING OF THE FOUNDRY
- Too big areas will be filled by storage
- Rotating of WIP is a good indicator
- Empty areas should be blocked out
- A few big castings per year do not motivate too big equipment

ENERGY EFFECTIVE FOUNDRY
OPERATION 4/5

- ENERGY EFFICIENCY – CHARGING ELECTRIC FURNACE
- CHARGE COMPOSITION RIGHT – NO ADDITIONS
  - ESPECIALLY N CARBON ADDITIONS TO BE AVOIDED
    - SLOW AND UNKNOWN YIELS
    - NEEDS NE W SUPERHEATING
    - RISK FOR PRIMARY GRAPHITE
    - NEEDS NEW ANALYSIS – TAKES TIME

    TARGET CARBON ON TOP LEVEL SO THAT IT IS NEVER BELOW
    TARGET SILICON ON LOW SIDE – IT IS EASY TO ADD

- SIZE OF SCRAP OPTIMUM – DENSE CHARGE
- START MELTING JUST BEFORE NEED
  - STANDING IN FURNACE KILLS NUCLEI – WASTE OF PRODUCTION
  - STANDING COSTS A LOT ENERGY AND LINING
  - IN FULL SPEED CHECK THAT POIRING IS POSSIBLE IMMEDIATELY AFTER MELT IS READY

Constant follow-up is needed in energy use…

Anno		**2007**	**2008**	**2009**	**2010**
Production	t/a	3915	4759	1733	1919
Total consumption	GWh/a	9,1	10,4	8,0	8,8
Nominal consumption	MWh/t	2,3	2,2	4,6	4,6

…otherwise may happen, as in this iron foundry.

ENERGY EFFICIENCY MEASUREMENT AND FOLLOW-UP IS A GOOD INDICATOR FOR OVER ALL EFFICIENCY OF FOUNDRY OPERATIONS !

Thank you for your attention!

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