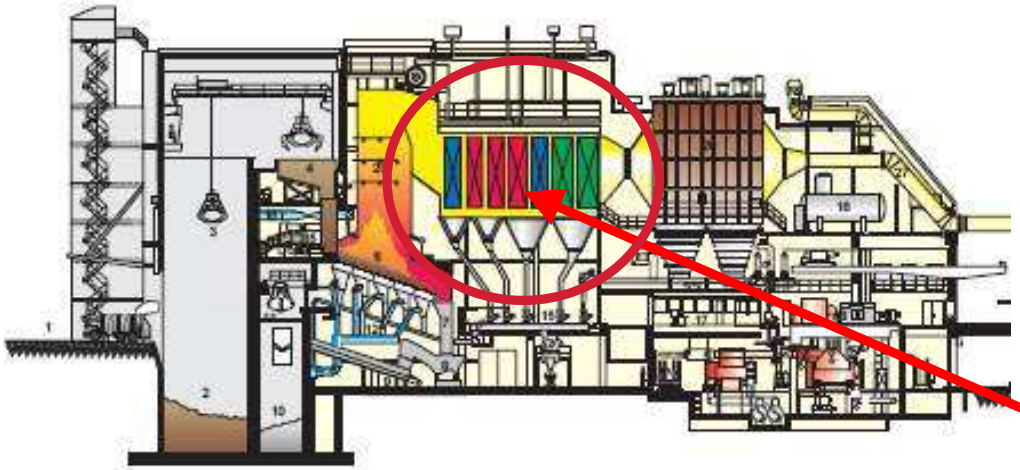
Norgren
Impact System

Impact cylinders used for cleaning of heating surfaces
at industrial- and waste incineration plants

Alexander Haug

Cleaning Heating Surfaces of Incinerators



Alternative

Existing Techniques

Mechanical drop hammer system

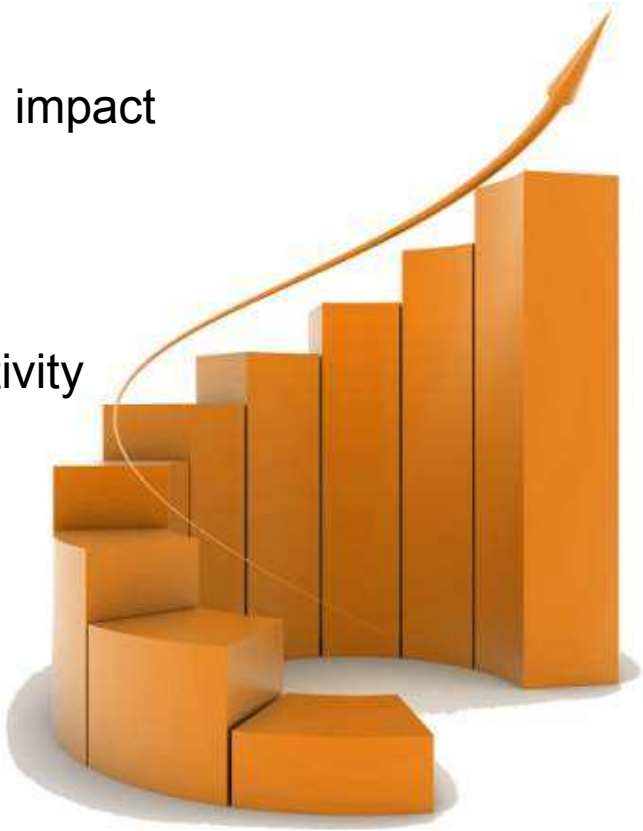
Electro-pneumatic impact wagon

Pneumatic Single Rapping

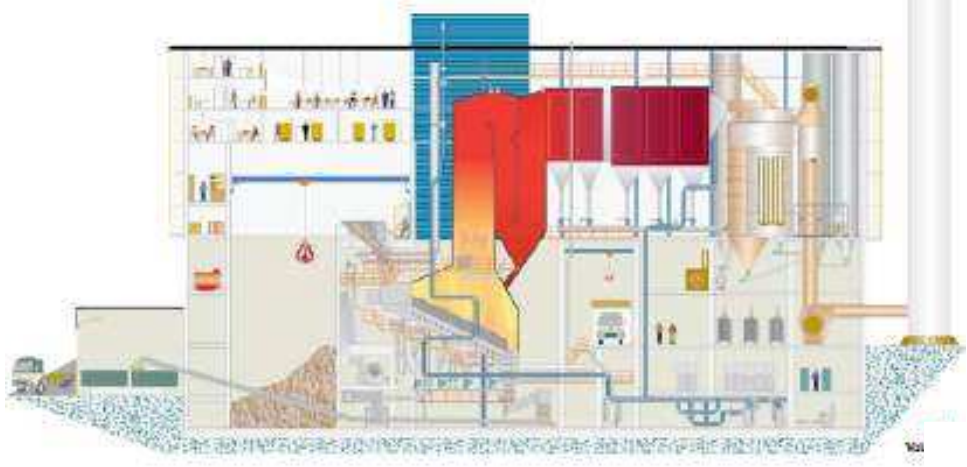
Demand of the customers

Optimization of the cleaning system

- Optimal cleaning of the heat exchange surfaces to optimize the absolute efficiency
- Subsequent and Individual adjustment of the impact force
- Reducing maintenance costs
- Reducing the construction volume
- Feedback to control room of the cleaning activity
- Check the wear and inform about failures
- Process stability
- Guarantee maximum travel time



Key Advantages of Norgren Impact System



- Optimal cleaning
  - Extend the maximum travel time of the plant
  - Guarantee high overall efficient
  - Maximize the waste throughput
- Keep an "Eye" into the boiler
  - Check the wear and inform about failures
- Subsequent adjustment of the cleaning system to your plant
  - In- / decrease the impact force
  - Change the iteration of the cylinder groups
- Nearly no maintenance and no spare and wear parts
- Comfortable operation and feedback to the control room

Mechanical Drop Hammer System

- No individual triggering of the rapping groups
- High wear due to mechanical moving parts → maintenance costs
- High noise level → sound absorption necessary
- Significant process failure → single failure stops complete system
- Large construction volume
- No oscillation of tube bundles possible

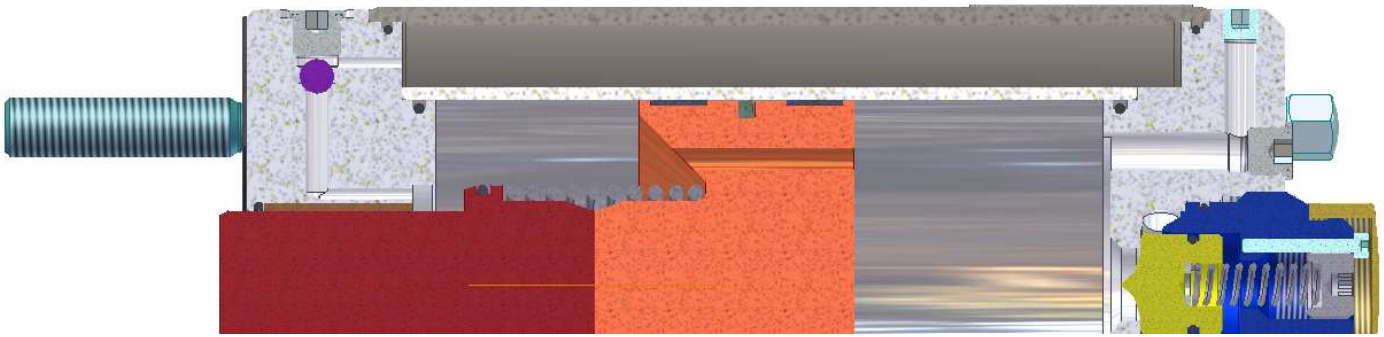
Electro-pneumatic Impact Wagon

- Large construction volume
- No individual triggering of rapping groups
- High wear due to moving wagon → maintenance costs
- Significant process failure of wagon → single failure stops complete system
- No control that the impact cylinder hits the plunger
- No feedback to remote monitoring station
- Start up problem with limit switch adjustment → complex commissioning

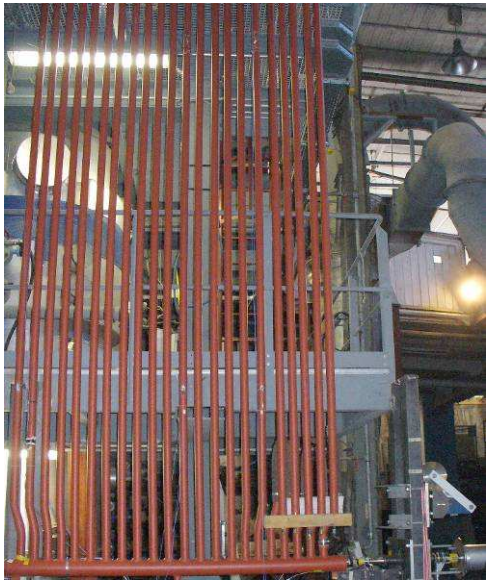
Pneumatic Single Position Rapping

- Individual adaptation of impact force for each point
- Wear indicators
- Check the wear and inform about failures
- Low noise level
- High process reliability
- Low maintenance cost and just a few spare and wear parts

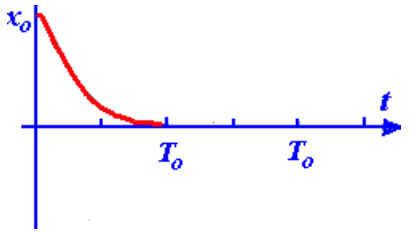
Force Compensation



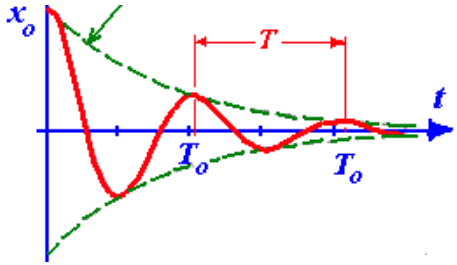
» Force reduction in the end position leads to better vibrations on the pipes



Without compensation



With compensation



Extension Operating Time

Optimum removal
with controlled
resudial deposit*

Insufficient removal
(mechanical drop
hammer and impact
wagon systems)

Poor or no removal

Extension Operating Time > 30%*

*Result of a comparison, Waste-to-Energy Plant Switzerland

Example for used tube bundles

Old fashioned rapping system

- Polluted heating tubes
- Gas flue is blocked
- Bad heat exchange
- Low efficiency

Gas flow

Single position rapping

- Cleaned tubes
- Gas flue is not blocked
- Optimal heat exchange
- High efficiency

Cost Benefits

	Drop Hammer	Impact Wagon	Norgren
Initial Investment	100 %	100 %	110 - 120 %
Maintenance Cost	€ 95.000	€ 43.000	€ 11.000
Benefit per Revision	-	-	Min. € 32.000

Reference List for Impact System

Germany:

- MVA Leuna Kessel I + II
- MVA Sonne (Großräschen)
- MVA Premnitz
- MVA Hameln
- MVA Herten
- MVA Köln

International:

MVA Dürnrohr Boiler 1 + 2	(Austria)
MVA Dürnrohr Boiler 3	(Austria)
MVA Pfaffenau	(Austria)
MVA Amsterdamm	(Netherlands)
KEBAG Emmenspitz,	(Switzerland)
KVA Chevenez, Genf	(Switzerland)
KVA Turgi Aarau	(Switzerland)

Actual Projects installed in 2009

- Dürnrohr 3 — 146 cylinders
- Hameln — 216 cylinders
- MVA Mannheim — 158 cylinders
- Delfzijl 1 + 2 — 416 cylinders

Project Delfzijl Boiler 1+2

Boiler 1 + Boiler 2 == 416 cylinders

Project Delfzijl Boiler 1+2

Control cabinets for Boiler 1

Master **104 valves**

Slave **104 valves**

Project Delfzijl Boiler 1+2

Left wall of boiler 1 → 104 cylinders

Right wall of boiler 1 → 104 cylinders

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