The future of cooling - process industry examples -

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In the steel industry cooling is used to achieve special properties in modern steels.

The production of steel is linked to high temperature treatment. The reactors and the equipment have to be cooled.

- Water cooling
- Air cooling
- New cooling
Life Cycle of Water

ABOUT 90% OF WATER USED IS RETURNED TO SOURCE

Use

IN

Treatment

Treatment of water can be biological, chemical or physical.

Use

Water is used for cooling and in the steelmaking processes.

OUT

Source: worldsteel.org
High water demand
low water consumption

Water intake and discharge at 20 steel plants surveyed*, including sea water for once-through cooling

*Sample of results from 'Water management in the steel industry' report, worldsteel, 2011
Continuous Casting of Steel
precise temperature

Air-water-cooling (2-phase)
• Precise
• Mild

Technical data
• Slabs
  1.000 <w<2.150 mm
t < 257 mm
• 2 strang arc-typ caster
• 80t tundish (distributor)

Cooling of the hot strang
• Single nozzle on/off modus
• Zone cooling over width
• Less edge defects at slabs
• Important for high strebgth steels
New cooling medium in annealling processes

Development of an ultra fast cooling concept based on the dispersion of a liquid hydrocarbon in a continuous heat treatment line for steel strips (ULTRA DRY COOLING)

• Higher heat flux
• Production of modern high strength steels (quenching & partinioning)

Figure 87: project layout of UDC integration in a CAL to produce Q&P steel.

Source: Research Fund for Coal and Steel (RFCS)
Nanoparticles increase heat exchange in cooling water systems

Nanoparticles in Thermoelectric Power Plant Cooling Fluids

Metals Cooling

- Exploit both the thermal enhancement and increase in viscosity

- TATA Steel are commercialising TiO$_2$ nanofluids (CoolFast) for cooling of steel and metal components to reduce production time

- Nanofluids reduced the 16 hour cooling cycle by 1-2 hours, a 1 hour reduction would save that particular line in the region of $1$ Million per annum (as well as the obvious reductions in water use etc).

Easing power plant water requirements by up to 20%, from water shortages, and broadening siting options.
Thank you for your attention

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