Minewater 2.0

Development of a Hybrid Sustainable Energy Infrastructure in the Municipality Heerlen the Netherlands

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Content

1. Goals Minewater 2.0
2. Concept Minewater 1.0
3. Concept Minewater 2.0
4. How it works
Minewater 2.0

Goals

1. Long term maximum use of geothermal underground for sustainable heating and cooling of buildings
2. Becoming an essential part of the Sustainable Energy Structure Plan 2040 municipality Heerlen (carbon neutral city)
3. Minewater Corporation with a sound business case
4. Promotion of local employment
5. Involving local educational and research institutions
6. High social involvement and sustainability awareness inhabitants
Minewater 1.0
2008 – May 2013

Hot and cold return water in return well HLN3:

- $T_{\text{hot~supply}}$ 28°C
- $T_{\text{cold~supply}}$ 16°C
- $T_{\text{hot~return}}$ 24°C
- $T_{\text{cold~return}}$ 18°C

3D model of the underground mine water network (VITO)
Minewater 1.0
2008 – May 2013

3D model of the underground mine water network (VITO)
Temperature evolution of the hot (HH1) and cold (HLN1) production wells for different conduction factors (VITO).
Minewater 1.0
Flow pattern reservoir

Mijnwater 1.0, municipality Heerlen

Customers

Depth compared to surface
0
NAP 100
200
300
Coal seam
400
500
600
Mined coal seam
700
800
900

Infiltration
Summer
Winter
Minewater 1.0
Other restrictions

- Limited hydraulic and thermal capacity
- Not demand driven and single acting:
  - Summer April until September only cold supply
  - Winter October until March only heat supply
- No heat and cold exchange between buildings possible
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New Concept

• Energy exchange instead of energy supply:
  ▪ Between buildings through cluster grids
  ▪ Between clusters through mine water grid
• Energy storage and regeneration of mine water reservoir instead of depletion
• Enlargement hydraulic and thermal capacity
• Fully automatic control and demand driven
• Addition of poly generation (Bio CHP, reuse waste heat, cooling towers)
• Addition of energy storage in buildings and cluster grids
• System suitable for demand and supply side management in near future (Minewater 3.0)
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Final situation

Return well HLN3 out of order
Hot to Hot (HH2)
Cold to Cold (HLN2)
T hot supply 28°C
T cold supply 16°C
T hot return 28°C
T cold return 16°C
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Final situation

All wells bidirectional

November 2013
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Enhanced flow pattern reservoir
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Situation 2013

November 2013
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Situation 2013

Two new connections Cluster A

Arcus College
30,000 m²
CO₂: - 45%

APG Pension Fund
32,000 m²
CO₂: - 118%

November 2013
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Situation 2013

Cluster installation for energy exchange between cluster grid and mine water grid.
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Situation 2013

Pressurized buffer and boosting systems at hot and cold extraction wells
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Situation 2013

Sophisticated injection valves in hot and cold injection wells
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How it works

3 Levels of control:
• Building: Temperature
• Cluster: Flow
• Minewater: Pressure
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How it works

Artist impression Minewater 2.0 with geographically dispersed mine water installations
Minewater 2.0
How it works: CMS

How it works: CMS

Netwerk Priva installatie
Mijnwater 2.0 Heerlen

Sim kaarten levering opdrachtgever
Telemetrie verbindingen.
Via GSM/UMTS

Levering Internet verbinding
opdrachtgever.
Let op ADLS verbinding met Statisch
publiek IP adres.
Minewater 2.0

Thank you for your attention