MVSSA ANNUAL CONFERENCE 2017
EMPERORS PALACE

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Effective Cooling Mponeng Mine

Patience Leah Mokgosi

Mponeng Mine Background (AGA)
“THE WORLD’S DEEPEST GOLD MINE”

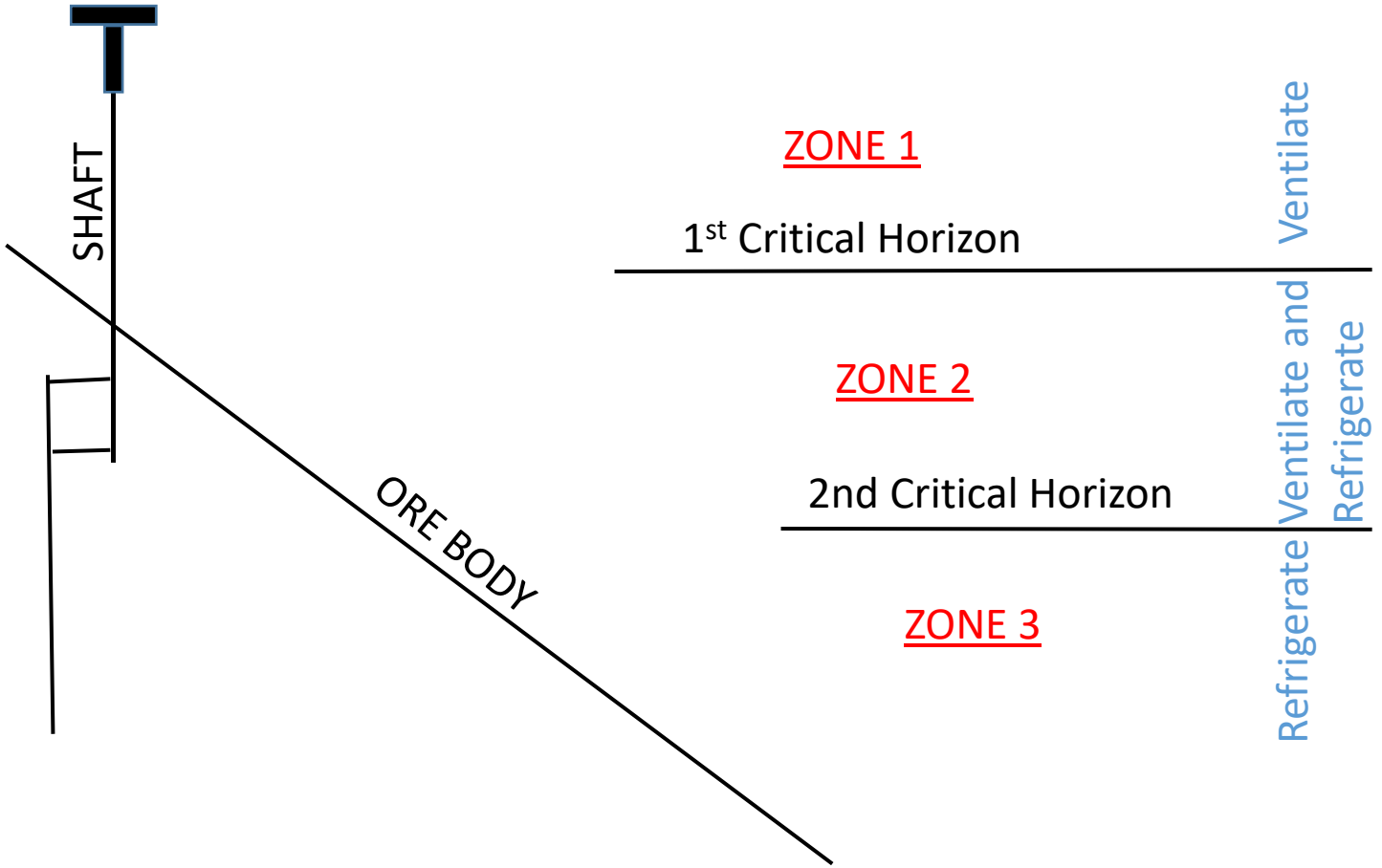
Anglo Gold Ashanti’s Mponeng Mine is located less than 100km west of Johannesburg
On the Witwatersrand gold belt where gold mining dates back to the late 1800s

Sinking of Mponeng mine began in 1981

All production of Mponeng Mine is sourced from the Ventersdorp Contact Reef
at a depth of over 3500m

The below 120 project increased the Mine Life by eight years(8) to 2024
Plans are already in place which would extend the life of mine to beyond 2040

Overview



The proper balance is required between air flow and refrigeration

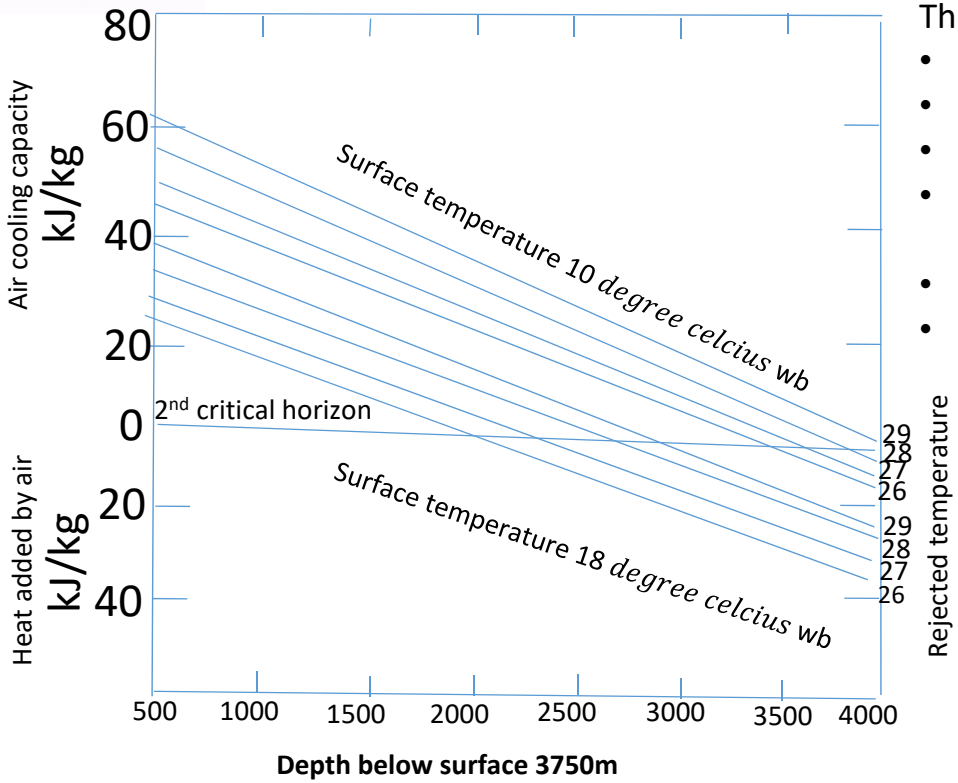
The correct positioning of the cooling appliances is critical

The effect of depth and air quantity on cooling requirements

Ventilating air and cooling are used in deep hot mines to maintain design environmental standards.

The amount of cooling used will be dependant upon:

- depth of the workings below surface,
- volume of rock mined and type of mining method,
- virgin rock temperature,
- heat sources situated in intake air, hoists, pumps, fans, etc.
- length of intake airways,
- cooling or heat absorption capacity of the available air



Cooling Capacity of downcast air

-The cooling capacity of air is the difference between Sigma heat content of the air at the station temperature and the sigma heat content at reject temperature.

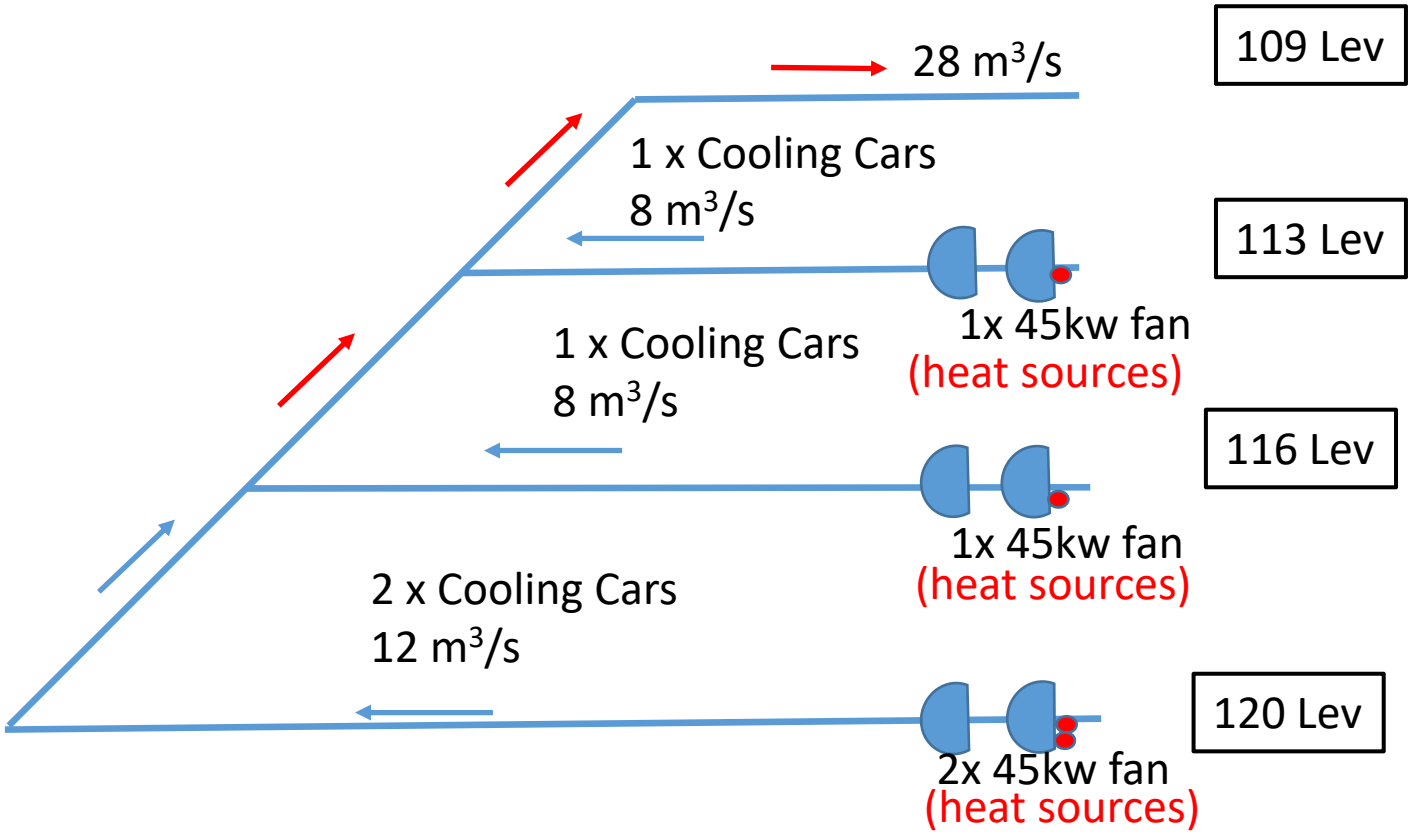
-The station temperature is influenced by the effect of auto-compression at depth,

as the depth increases also the temperature at the station increases and the cooling capacity of the air decreases.

Mponeng Design

- **Sequential grid stoping configuration**
  - 3 x stopes in series
- **The maximum distance from the shaft is 5950m, average distance being 3600m**
- **Mean Rock Breaking Depth**
  - The Mean rock breaking depth is 3750M
- **Mean Virgin Rock Temperature**
  - The maximum virgin rock temperature is 56.3°C (126 level)
- **Re-Use of air**
  - Approximately 20 % of air will be reused through stopes in series before being returned to the upcast shaft
- **Mponeng was designed with:**
  - 2X Cooling Car at intake level
  - 1X Cooling Car in the Middle Level
  - 1X Cooling Car at top level
  - 120 Level (intake) 12m^3/s
  - 116 Level (intake) 8m^3/s
  - 113 Level (intake) 8m^3/s
  - 109 Level (Return) 28 m^3/s

Mponeng Design



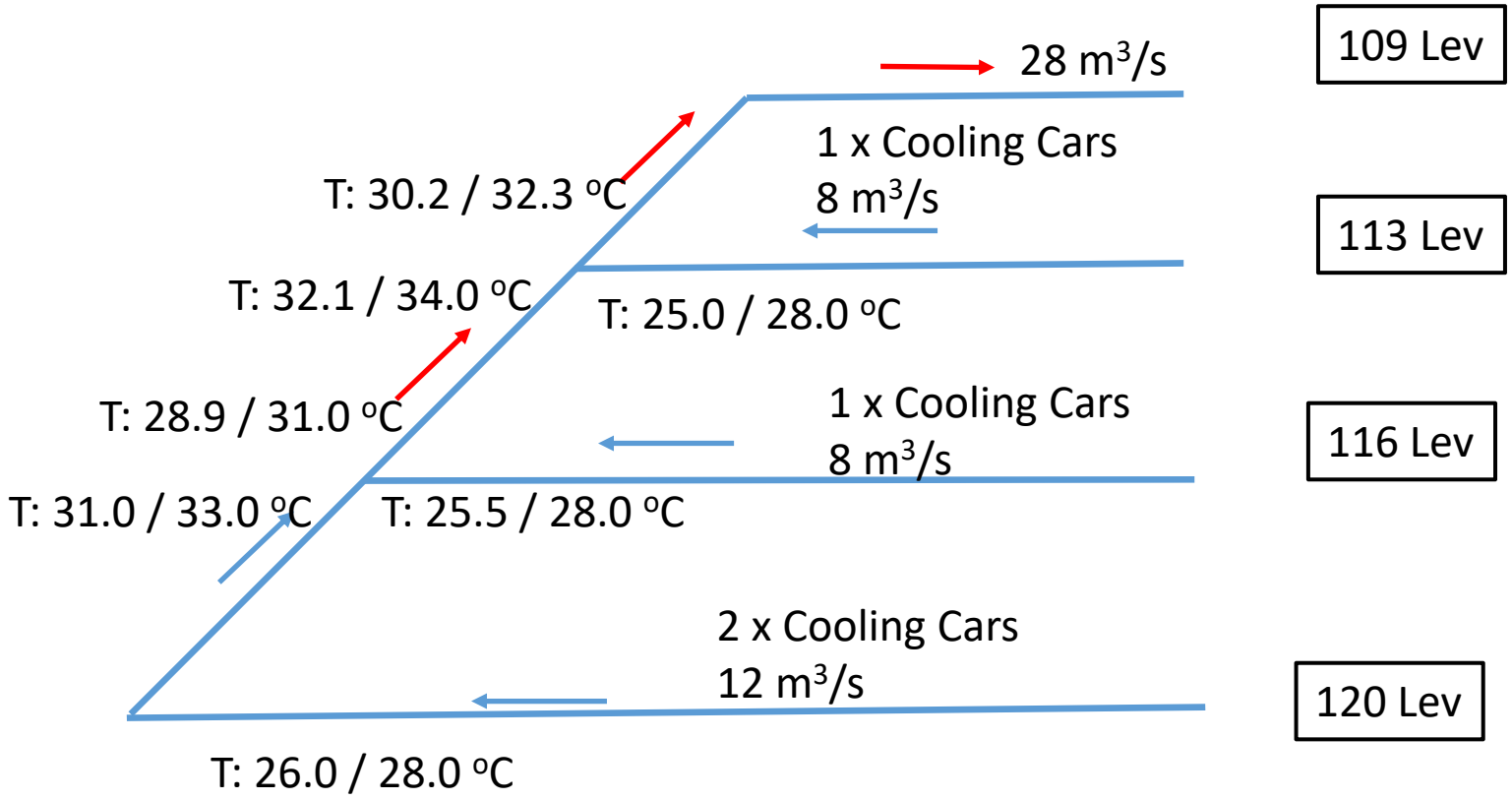
Challenges faced with the design

- Limited chilled water availability (300mm pipe – 150 l/s)
  - Demand exceeds supply capacity
  - Reduced water flow through cooling appliances

- The heat load is calculated but not taken into consideration – we always defer to the “current” design
  - Therefore inadequate cooling installed

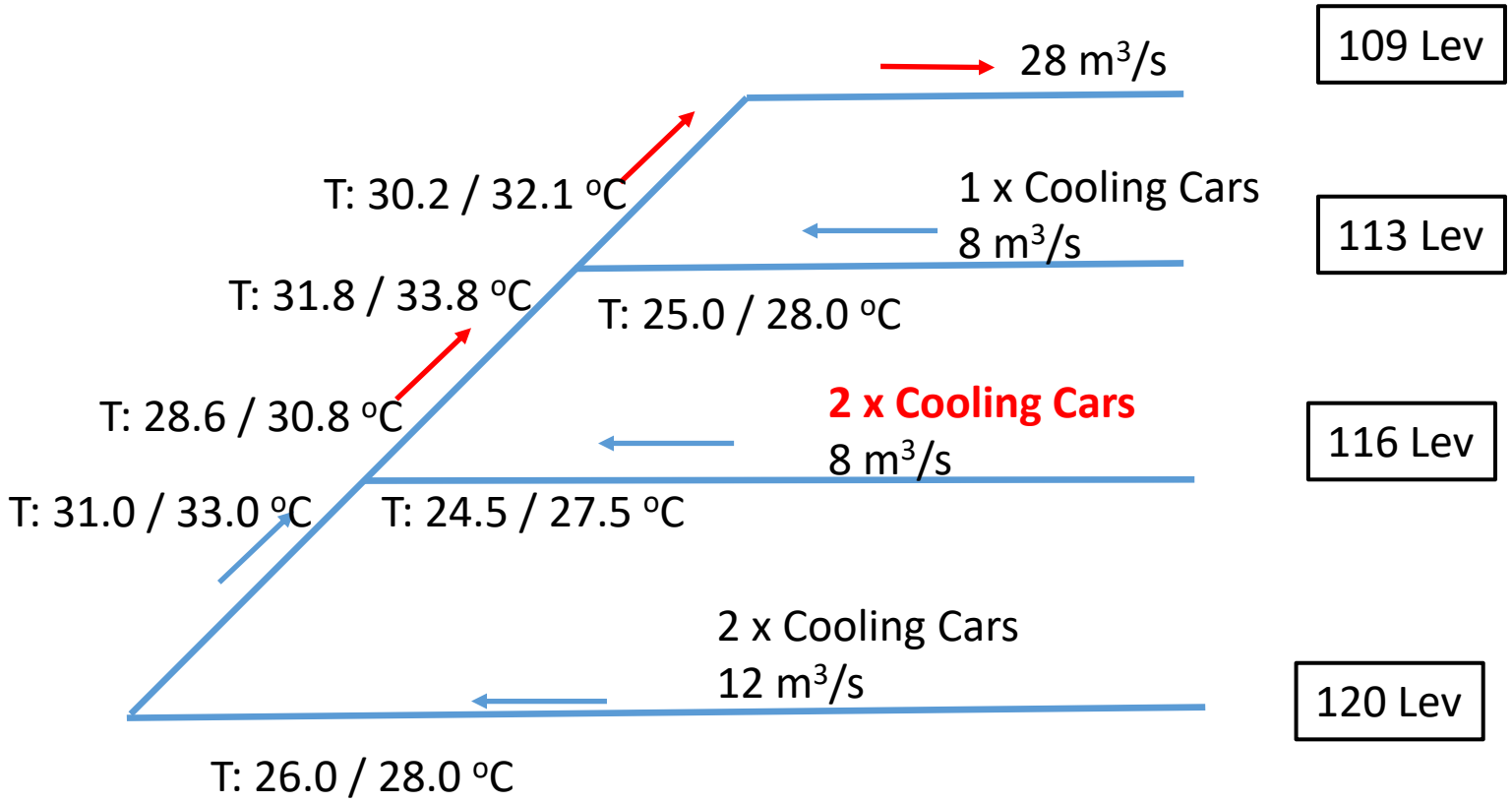
- Elevated intake air temperature to second and third stopes

Mponeng Design



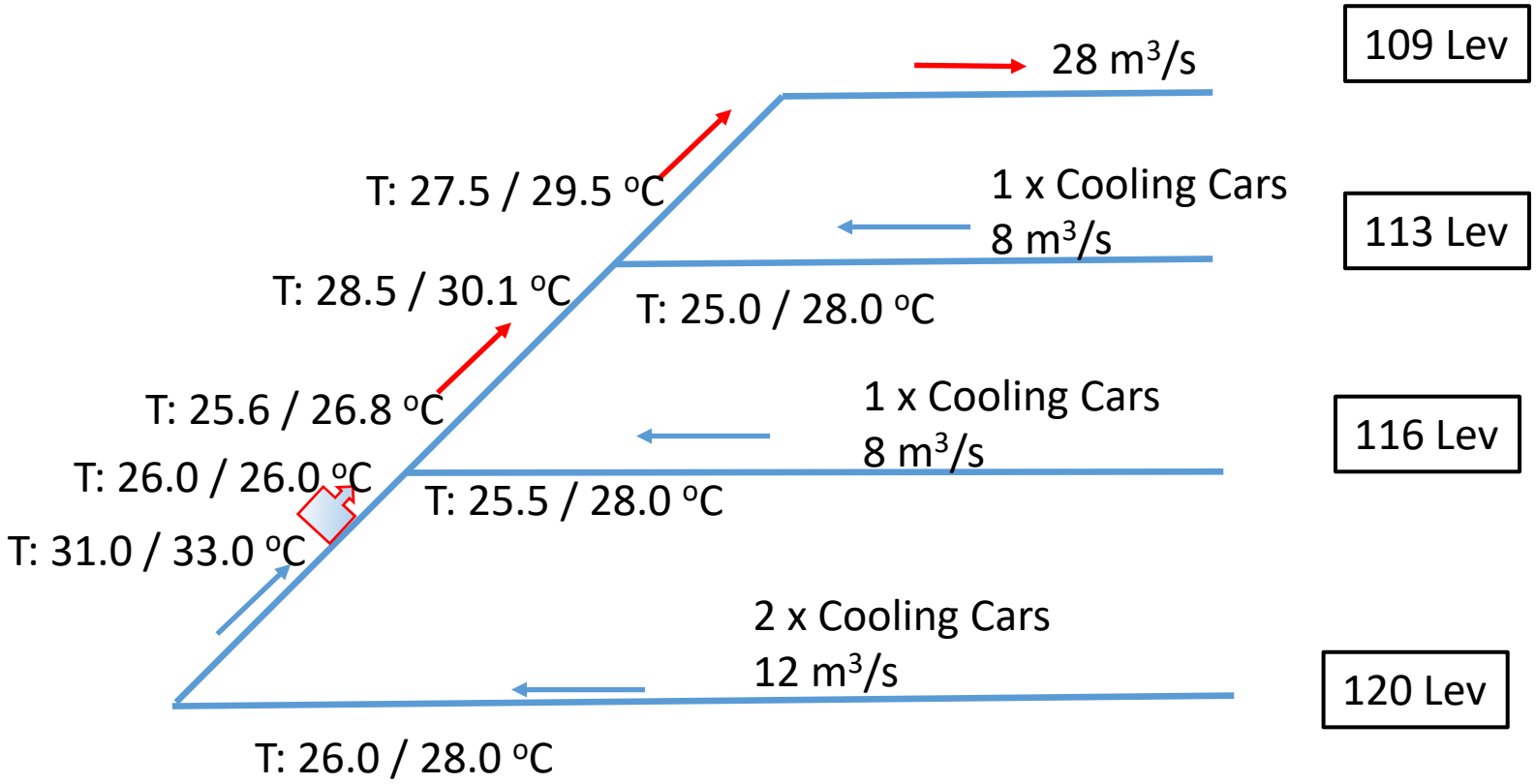
Current conditions

Mponeng Design



Plan 1 – Additional Cooling on 116 Lev

Mponeng Design



Plan 2 – Install in Stope cooler (500 kW coil)

Conclusion

- Limited benefit in Wet Bulb Temperature from installing second cooling appliance on 116 Lev

- Reduced temperatures in both the second and third stopes with in-stope cooler

- Reduced temperatures results in:
  - More comfortable working environment
  - Higher productivity
  - Safer workplace
  - Higher cooling power

- Cooling installed must be based on the heat load calculated during the planning process, one size does not fit all…….
- It must be realised that mining is a dynamic, ever changing process and, therefore a flexible but systematic approach is necessary.


THANK YOU
FOR
YOUR
ATTENTION!
ANY QUESTIONS?