Airway Velocity "Rules of Thumb"

More guidelines than hard and fast rules

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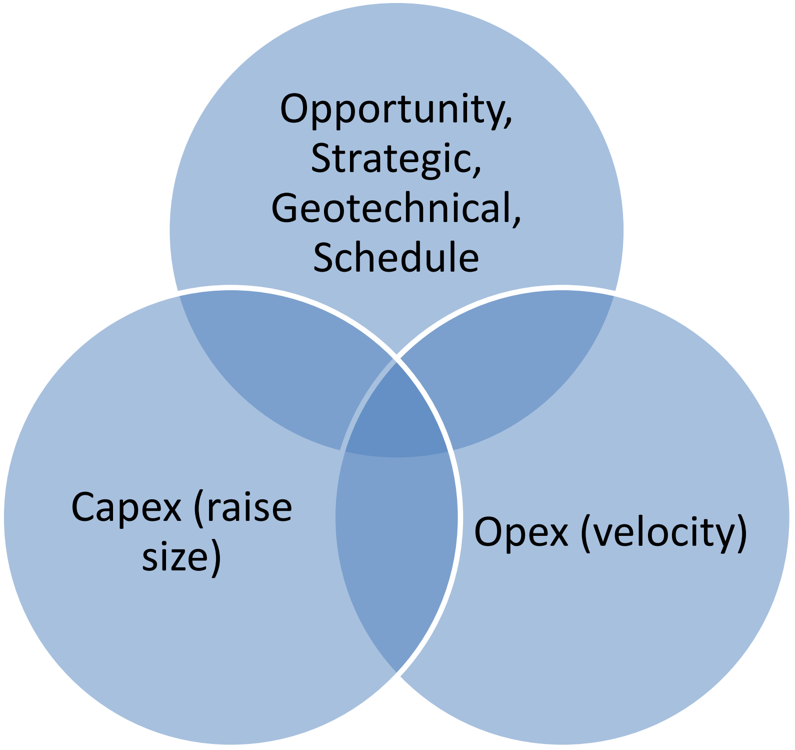
Contents

Introduction

- Economic velocities typically consider the cost of power, development costs and operational risk.



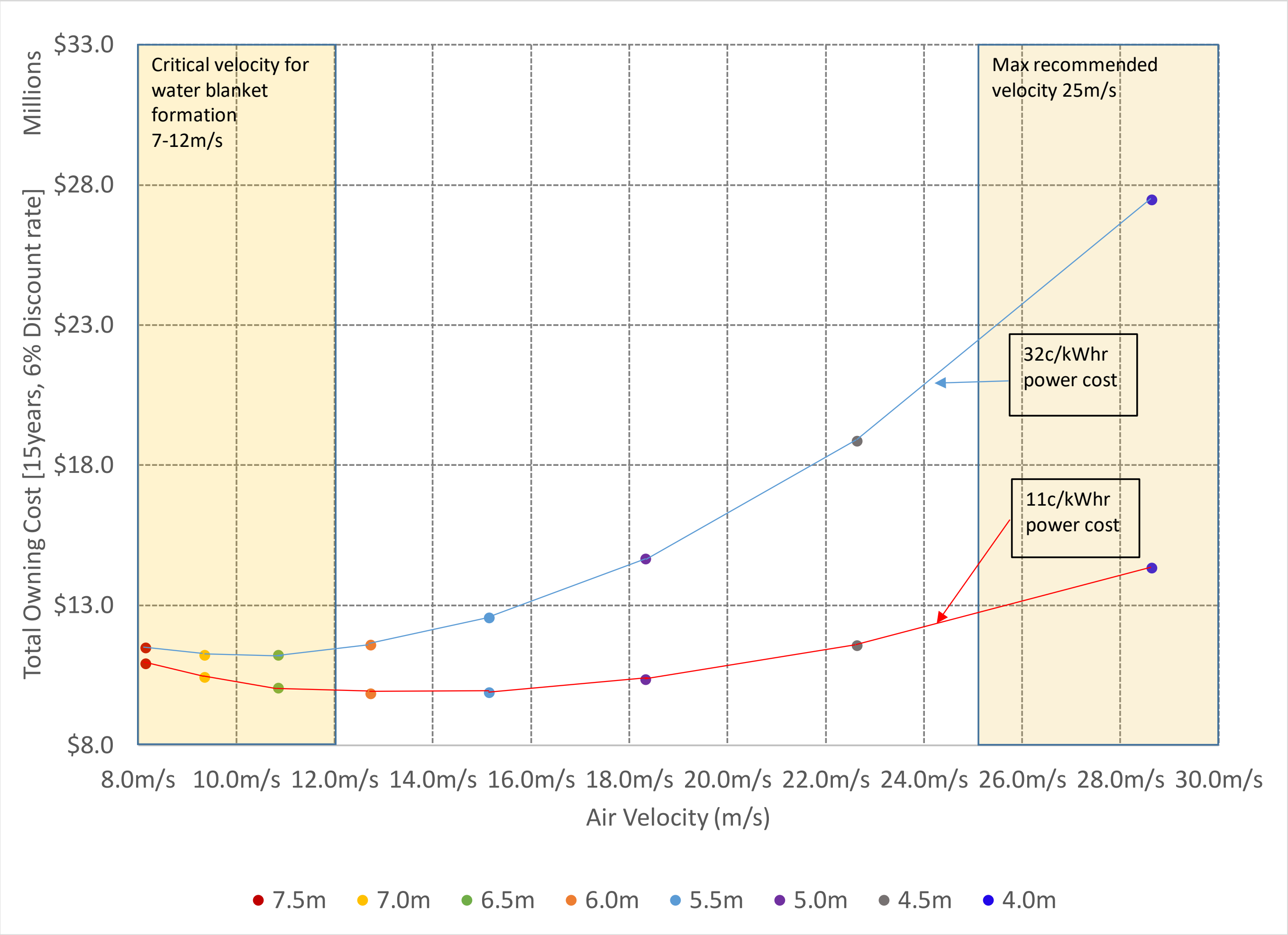
Textbook optimisation

The following financial and technical inputs were used for this analysis:

- Raise boring cost $9,647 per m depth
- Project Life 15years
- Discount rate 6%
- K Factor 0.004 Ns^2/m^4
- Fan efficiency 80%

- Low Power cost $0.11c per kW/hr
- High Power cost $0.32c per kW/hr

Textbook optimisation



Other issues to consider

There are several issues that are not factored into this classic textbook optimisation.

- Project CAPEX constraints.
- Schedule constraints and the availability of raise boring resources.
- Geotechnical constraints.
- Mining depth and dip of ore body.
- Surface access.
- Environmental issues

Design vs. operating considerations

- Designing at higher airspeeds ≠ operating at high speeds for the LoM.

- Airflow demands vary as production demands change and so will the airspeed.

Problem statement

- Does the textbook theoretical economic assessment mean that designs at higher airspeeds are no longer acceptable or fatally flawed?

- A number of hypothetical example cases based on real projects the authors worked on is presented with the following underlying themes:
  - CAPEX and geotechnical constraints
  - Strategic considerations
  - Large project and schedule considerations
  - Opportunistic to defer CAPEX

Case Study A – Capex and Geotech constrained

- Airflow increase required from 725m³/s to 990m³/s
- More than 1.4km deep
- Geotechnically constrained below 1km all raises no more than 3.5m diameter
- CAPEX availability is limited

	<15m/s			17m/s			25m/s		
	990m³/s			990m³/s			990m³/s		
	Size	No.	Airflow [per raise]	Size	No.	Airflow [per raise]	Size	No.	Airflow [per raise]
RAR			**990m³/s**			**990m³/s**			**990m³/s**
Existing	5.0m	2	270m³/s	5.0m	2	330m³/s	5.0m	2	495m³/s
New	4.5m	2	225m³/s	5.0m	1	330m³/s	5.0m	0	
FAR			**725m³/s**			**725m³/s**			**725m³/s**
Existing	5.0m	1	275m³/s	5.0m	2	242m³/s	5.0m	2	363m³/s
New	4.5m	2	225m³/s	5.0m	1	242m³/s	5.0m	0	

Note: Balance of intake via hoisting shaft and decline

Case Study B – Large project and schedule constraints

- New Block Cave
- Remote location
- Difficult topography
- 2,800m^3/s required
- High VRT
- Contaminants

Case Study C – Opportunistic

- New surface raise established designed at economic velocity of 15m/s
- Challenging ground conditions
- Expansion planned into new mining area

Case Study D – Strategic

CONCLUSIONS