


The background of the slide is a photograph of the Trojan Nickel Mine. It features two prominent, tall, cylindrical ventilation towers with a light-colored, possibly metallic or concrete, finish. The towers are set against a clear blue sky with some light clouds. In the foreground, there is a blurred view of a paved area and a fence, suggesting an industrial or mining site. The overall scene is brightly lit, indicating daytime.

THE DESIGN OF A COMPUTERISED VENTILATION MONITORING SYSTEM AT TROJAN NICKEL MINE

BY NDANGANA NGONIDZASHE

(DEPARTMENT OF MINING ENGINEERING)





“ Wait until you go underground and you will appreciate the importance of fresh air!!!!!!!!!!!!!!!!!!!! ”

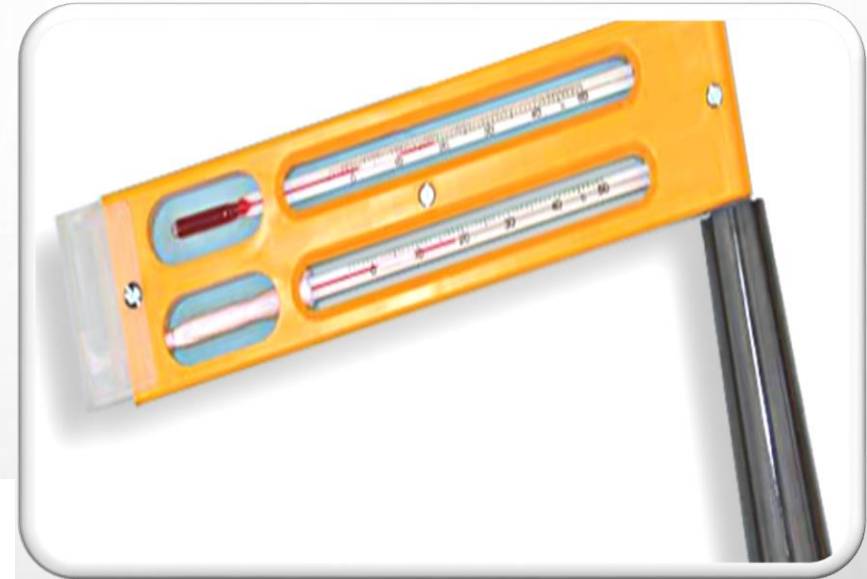
~NGONI NDANGANA

CHRIS MADDEN

INTRODUCTION



NEGATIVE PRESSURE AXIAL
FANS AT TROJAN



WHIRLING HYGROMETER



INTRODUCTION

AIR QUALITY

1. Carbon dioxide (<5000 ppm)
2. Carbon monoxide (<100 ppm)
3. Nitrous fumes (<5ppm)
4. Methane (<1.25%)
5. Hydrogen sulphide (<20 ppm)
6. Oxygen (> 16%)
7. Ammonia (< 50ppm)

➤ Temperature

➤ Humidity

AIR QUANTITY

- Air velocity
- Air flow











- **Trojan Nickel Mine Uses Old Methods Of Measuring Air Quality And Quantity. Because Of The Labour And Time Involved Every Section Can Be Surveyed Once Every Month.**

HOW THIS IS AFFECTING US...

INEFFICIENCIES OF THE OLD SYSTEM

- **FAINING**
- **FATALITIES**



HOW THIS IS AFFECTING US...

PRODUCTION TIME AND LABOUR LOSS

- If the ventilation surveying labour could be used for production.....

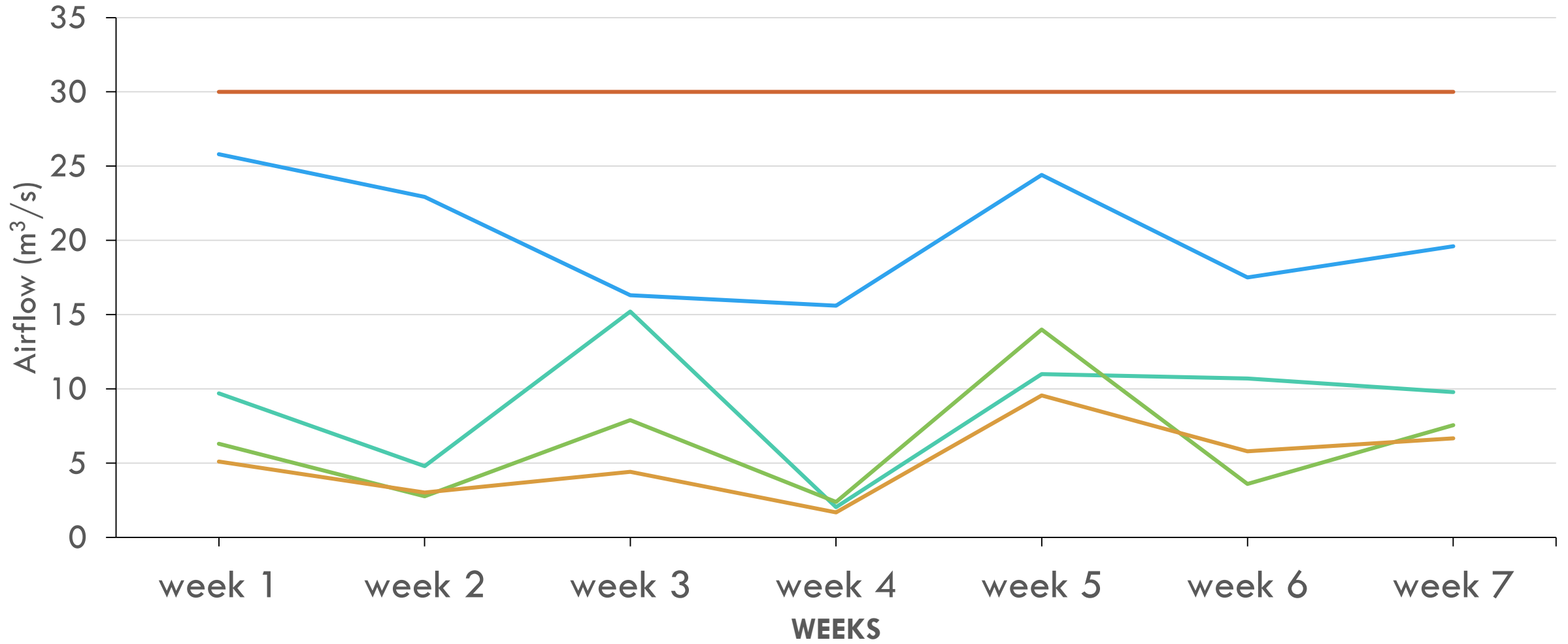
- Sums up to \$500 000 every financial year



WHAT WAS DONE...

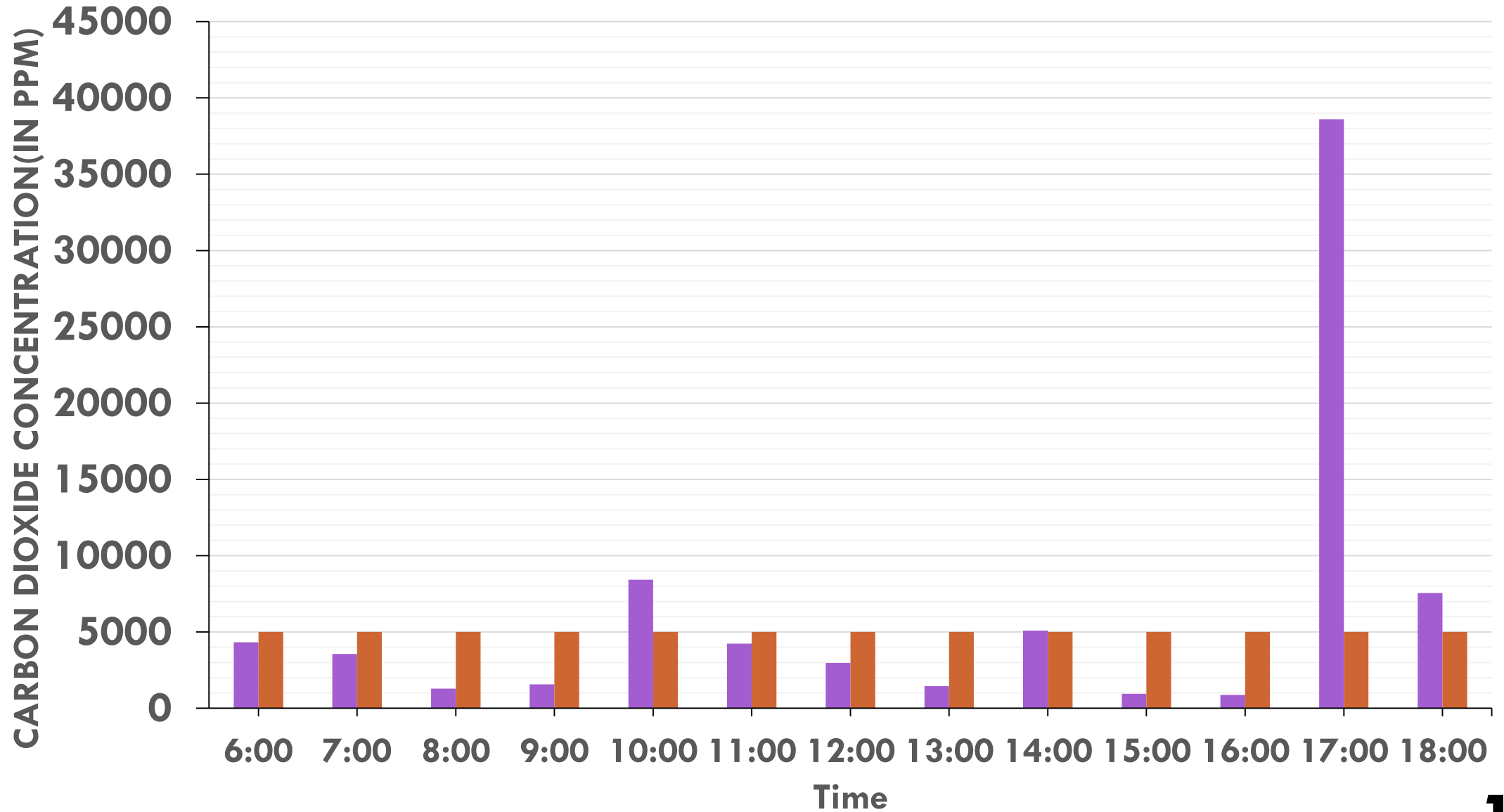
- **Project understanding and planning**
- **Desktop study**
- **Ventilation surveys**
- **Design of the proposed system**

WEEKLY AIRFLOW RECORDINGS



— point 1 — point 2 — point 3 — point 4 — point 5

Hourly Carbon Dioxide Concentrations



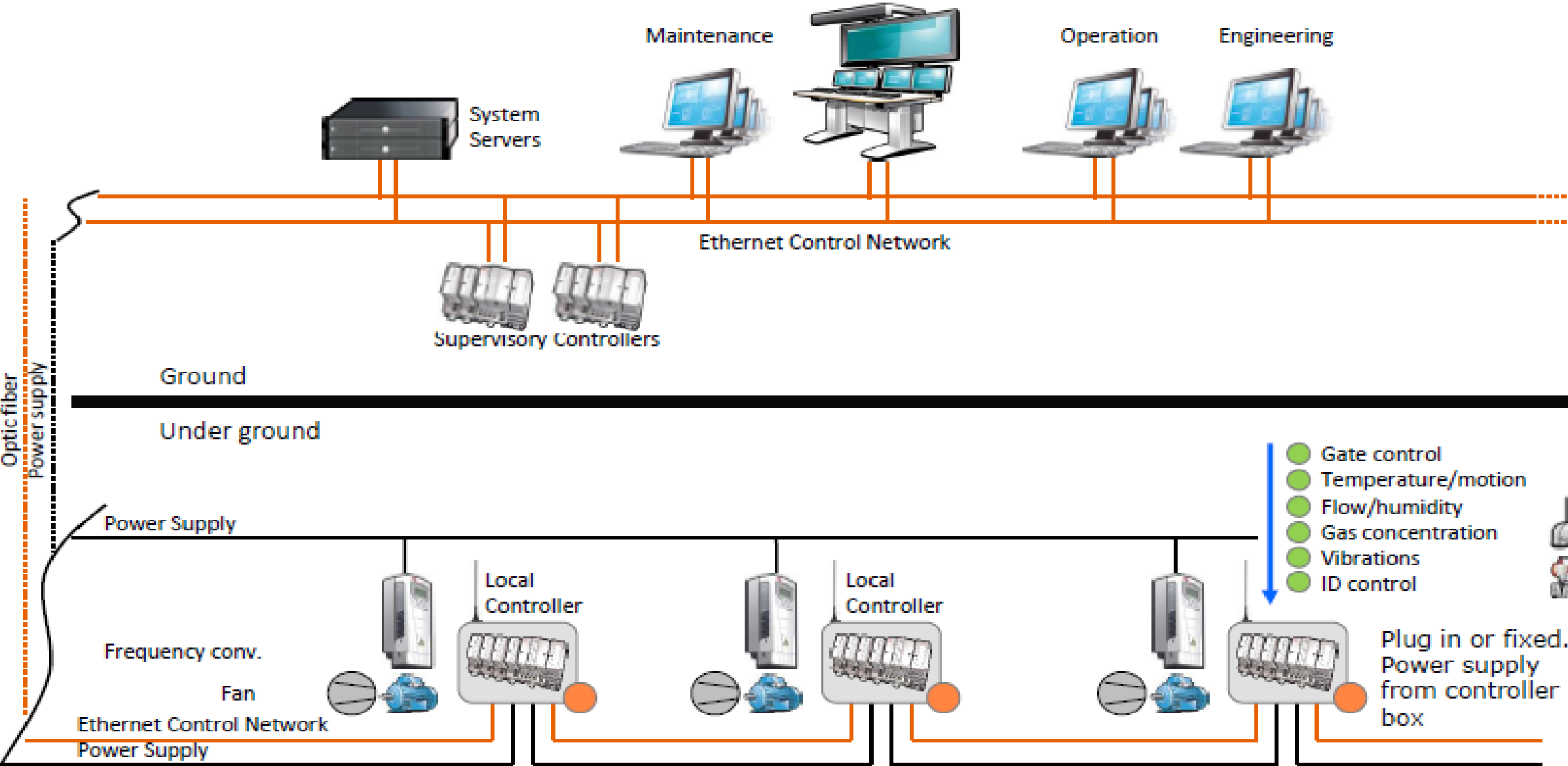
FINDINGS

- **The conditions at any instant are unique**
- **Reproducibility of any result is not possible**
- **Monthly surveys are not reliable**

DESIGN OF THE NEW VENTILATION MONITORING SYSTEM

- **HARDWARE SELECTION**
- **SOFTWARE DESIGN**

HARDWARE SELECTION



SOFTWARE DESIGN

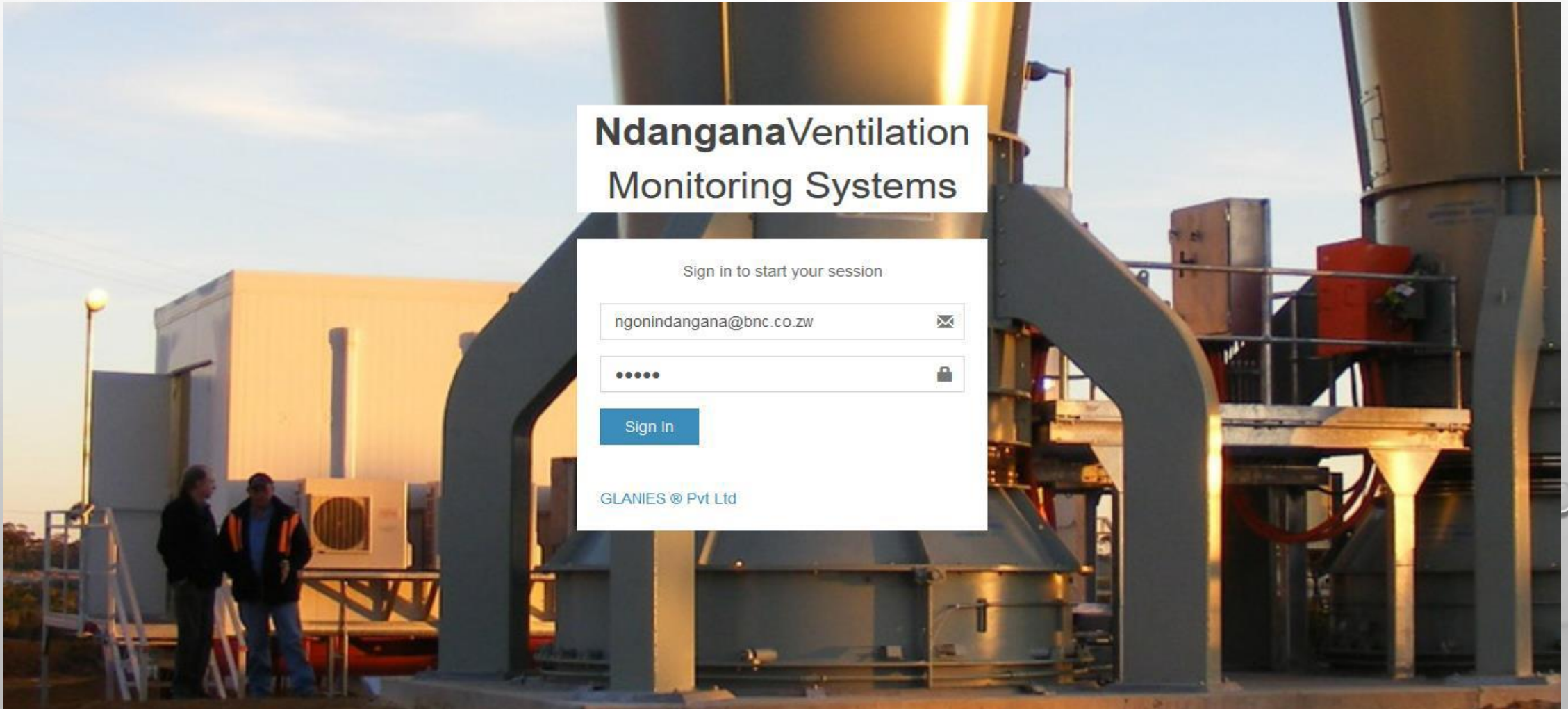
LANGUAGES USED

- **HTML and CSS for the interface**
- **PHP as a server side scripting language**
- **Java script to add interactive features to the interface**
- **The database used is MYSQL**

SOFTWARE DESIGN

- PROPOSED SECURITY LOGIN INTERFACE

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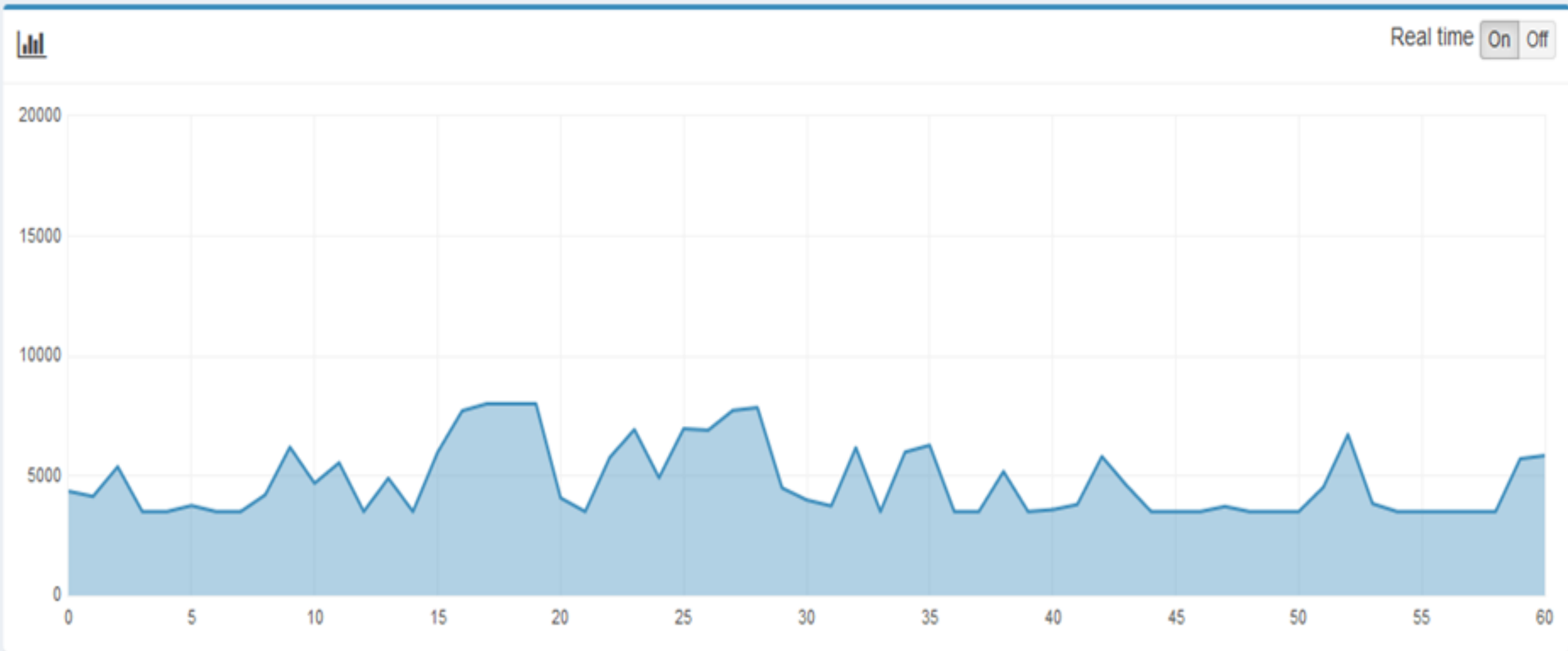
- PROPOSED AIR QUALITY AND QUANTITY INTERFACE

The screenshot displays the VenTRON software interface. At the top left, the logo 'VenTRON' is visible. The top right shows a notification icon and the user name 'ngoni ndangana'. On the left side, there is a navigation menu with the user profile 'ngoni ndangana Online' and a 'MAIN NAVIGATION' section listing levels: 33 Level, 35 Level, 37 Level, and 39 Level. The main content area is titled '39 Level : Entry' and contains seven data cards for different air quality metrics:

- Carbon Dioxide**: <5000ppm, More info
- Carbon Monoxide**: <100ppm, More info
- Nitrous Fumes**: <5ppm, More info
- Ammonia**: <50ppm, More info
- Hydrogen Sulphide**: <20ppm, More info
- Methane**: <1.25%, More info
- Temperature**: max:35deg | min:10deg, More info
- Oxygen**: >16%, More info
- Air Flow**: More info

- PROPOSED AIR MONITORING GRAPH

39 Level: Entry - Carbon Dioxide



- NOTIFICATIONS INTERFACE

All Notifications

[Home](#) > [Tables](#) > [Simple](#)

#	Air Quality	Date and Time
209	Carbon Dioxide : 5080	2017-02-26 13:57:11
208	Carbon Dioxide : 5010	2017-02-26 13:57:11
207	Carbon Dioxide : 5155	2017-02-26 13:57:11
206	Carbon Dioxide : 5036	2017-02-26 13:57:11
205	Carbon Dioxide : 5387	2017-02-26 13:49:53
204	Carbon Dioxide : 5102	2017-02-26 13:49:53
203	Carbon Dioxide : 5029	2017-02-26 13:49:53
202	Carbon Dioxide : 5245	2017-02-26 13:49:53
201	Carbon Dioxide : 5526	2017-02-26 13:49:53
200	Carbon Dioxide : 5135	2017-02-26 13:49:53
199	Carbon Dioxide : 5147	2017-02-26 13:49:53
198	Carbon Dioxide : 5161	2017-02-26 13:49:53
197	Carbon Dioxide : 5159	2017-02-26 13:49:53

RE-ENTRY PROCEDURE



RISKS

- **MISFIRES**

- **GASES (carbon dioxide, carbon monoxide)**

SOFTWARE DESIGN

BLAST EFFICIENCY ALGORITHM



ANFO = NITROUS + CARBON DIOXIDE + WATER + ENERGY



=



BUT MATTER IS NEVER CREATED NOR DESTROYED.....

ANFO IS PROPORTIONAL TO CARBON DIOXIDE

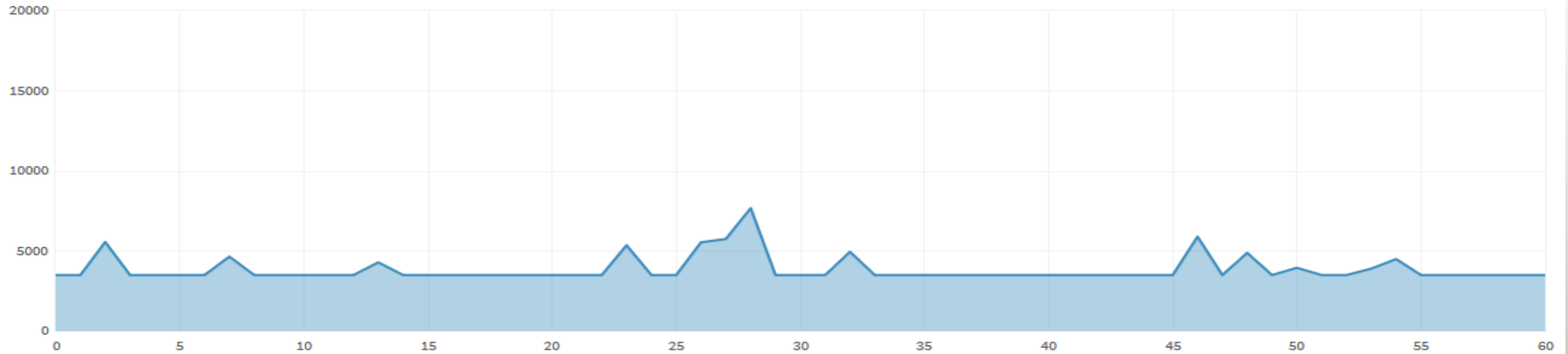
POST BLAST ANALYSIS

- BLAST EFFICIENCY INTERFACE

39 Left End : Carbon Dioxide



Real time On Off



Enter amount of explosives used in Kg/s

Submit

#	Units of Explosive	Theoretical	Blast Efficiency
5	420	840000	0.872381
4	500	1000000	0.7223

Clear All

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THE FUTURE



BENEFITS OF THE NEW SYSTEM

- **Detect air leakages**
- **Detect excessive gas emitting machinery**
- **Modelling air flow**
- **Monitor fan performance**
- **Have a computerised record of the mining atmosphere**
- **A finer and more accurate monthly ventilation report**
- **Save on labour and time**

BENEFITS OF THE NEW SYSTEM

- **Monitoring working atmosphere PROMOTING SAFETY**
- **Determine blast efficiency**
- **Save lives as re-entry gassing is eliminated**
- **Elimination of human error and result manipulation**

BENEFITS OF THE NEW SYSTEM



ECONOMIC BENEFITS

- **EMPLOYMENT CREATION**
- **INTERNALISATION OF FUNDS**
- **TAXES**
- **TECHNOLOGY**

INDIGENISATION!!!!!!

RECOMMENDATIONS

**TROJAN NICKEL MINE AND THE WHOLE MINING INDUSTRY
SHOULD ADOPT AND SUPPORT THE NEW SYSTEM OF
VENTILATION SURVEY AND DATA STORAGE.**

CELEBRATE NEW TECHNOLOGY!!!!!!!!!!!!!!



CELEBRATE THE FUTURE OF MINING ENGINEERING!!!!!!!!!!!!!!!!!!!!!!