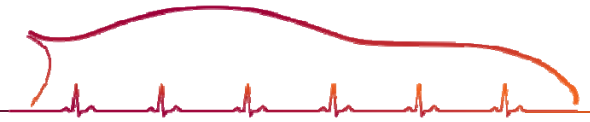
Development of a cost oriented grinding strategy and prediction of post grind IRI using improved grinder models

RPUG Annual Meeting

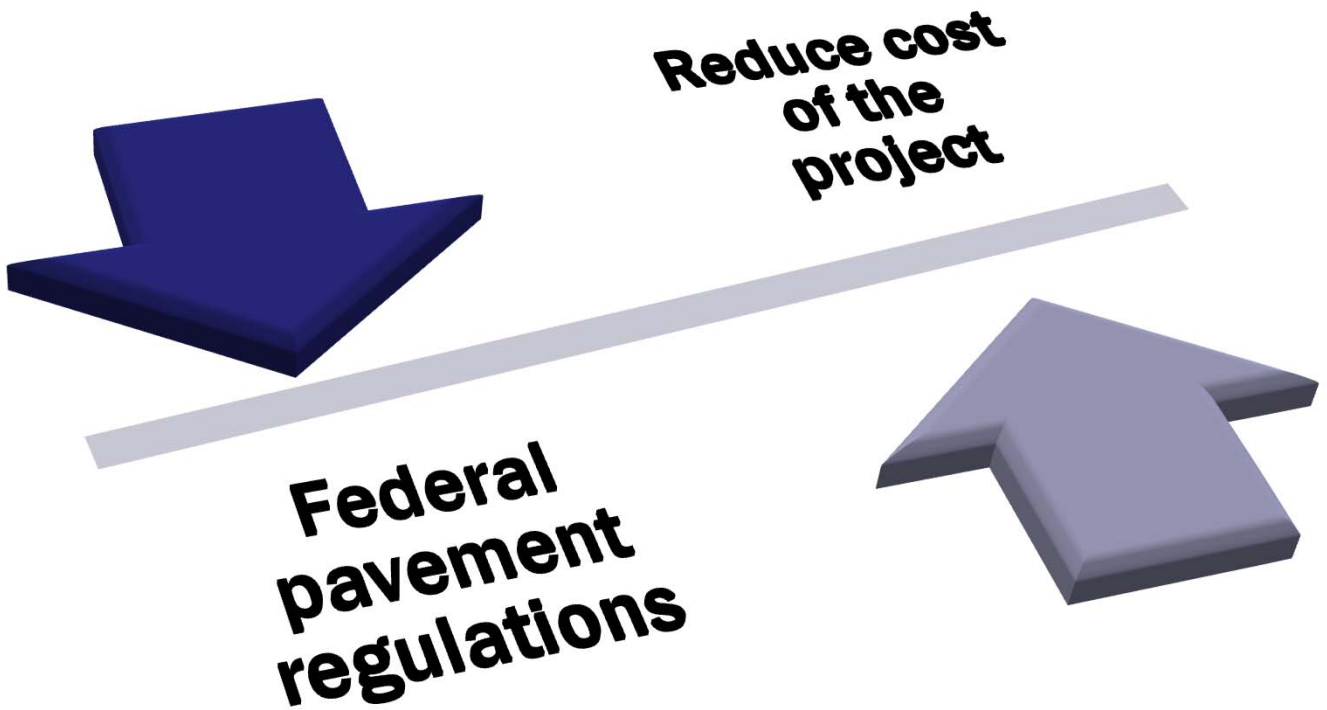
1st – 4th Nov 2016



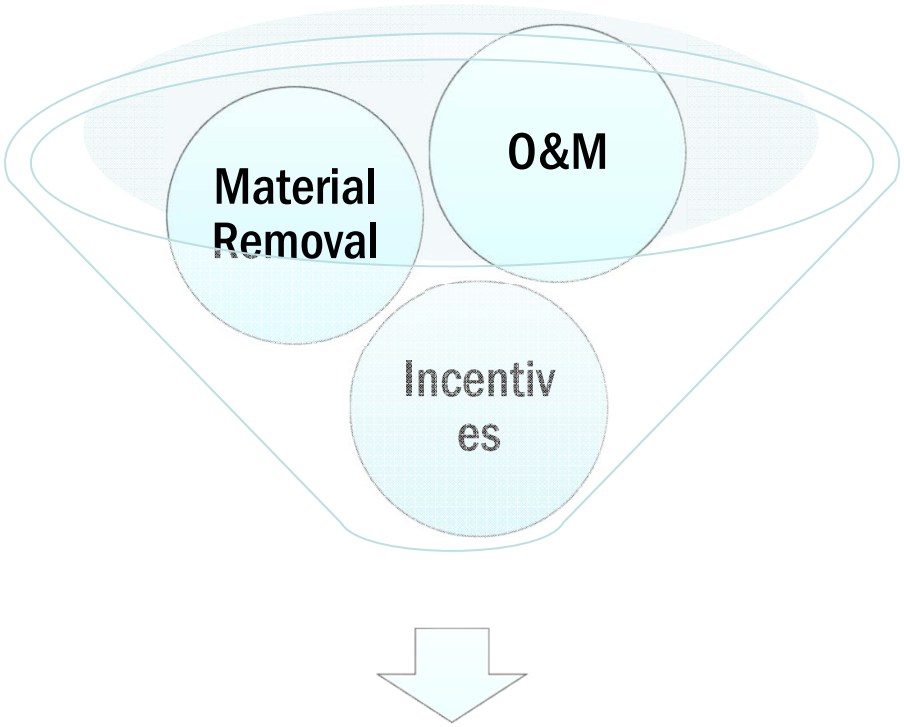
Introduction

- The presentation proposes a method for cost oriented optimization algorithm to select a grinding strategy that can maximize contractor's monetary benefits
- Outline
  - Need for the proposed research.
  - Cost of grinding.
  - Grinder models.
  - Post grind elevation profile.
  - Optimization algorithm.
  - Summary.

Need for the Cost Oriented Grinding Strategy

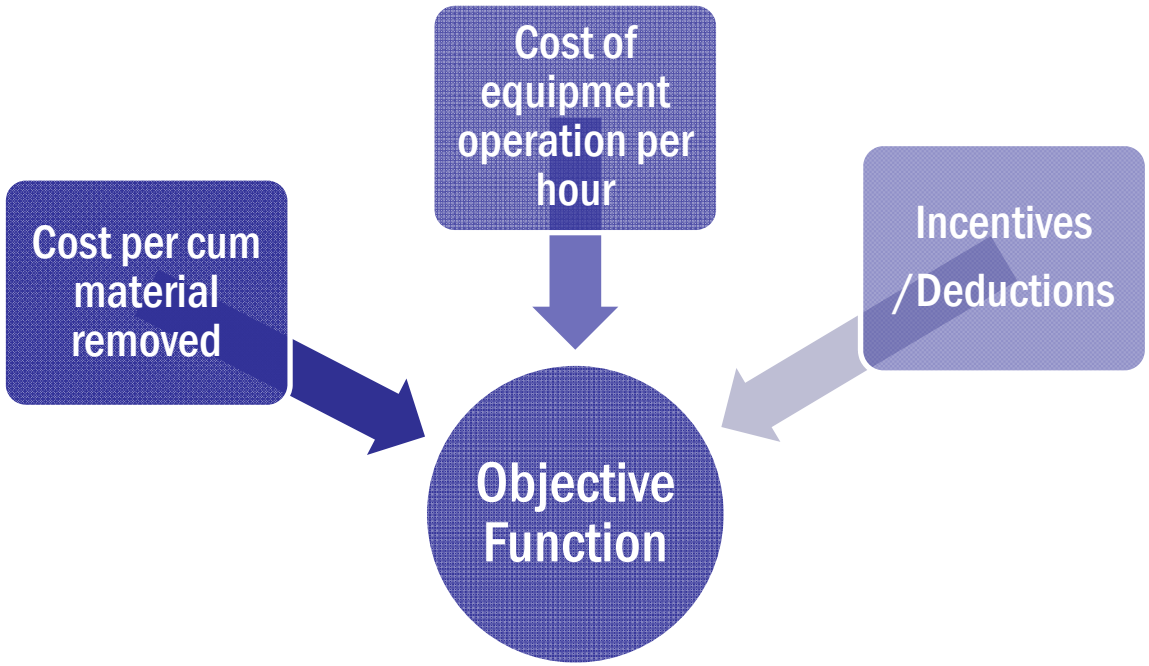


Grinding process costs

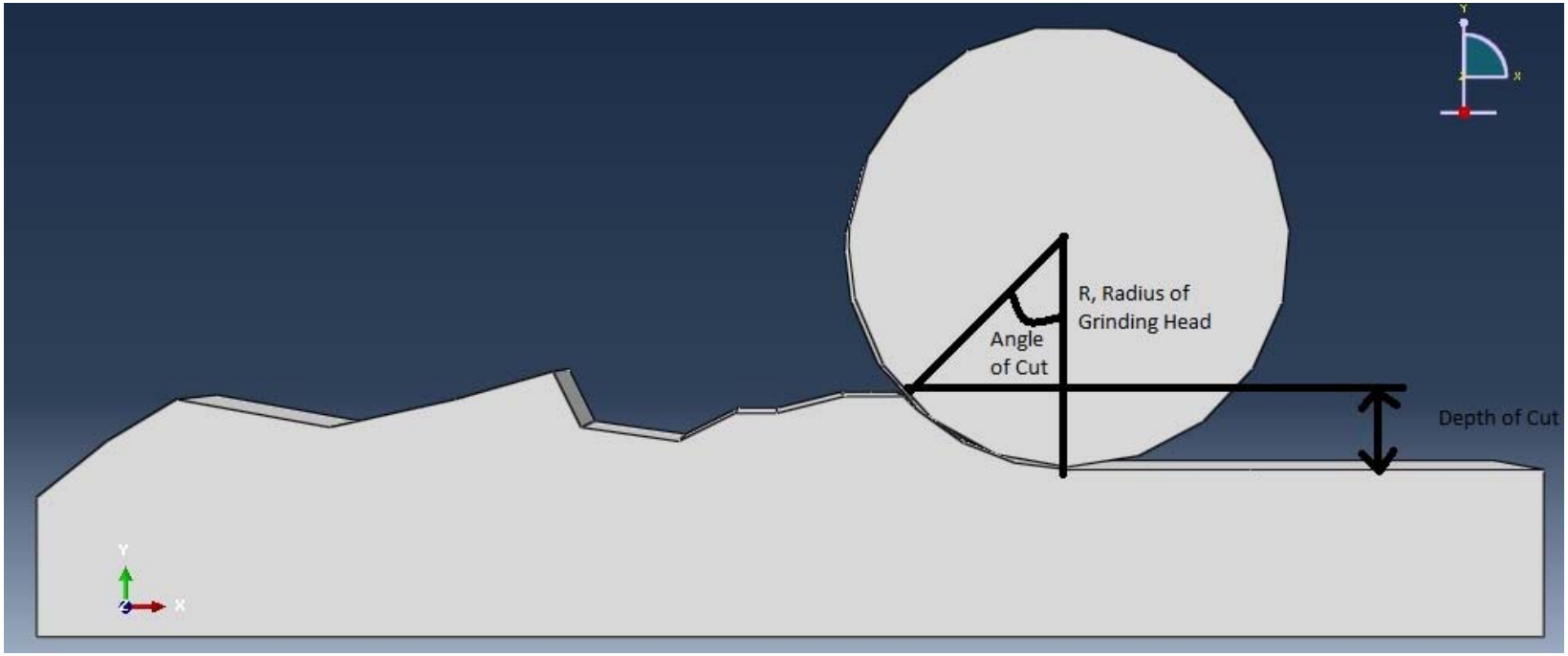


Setting up the Objective Function

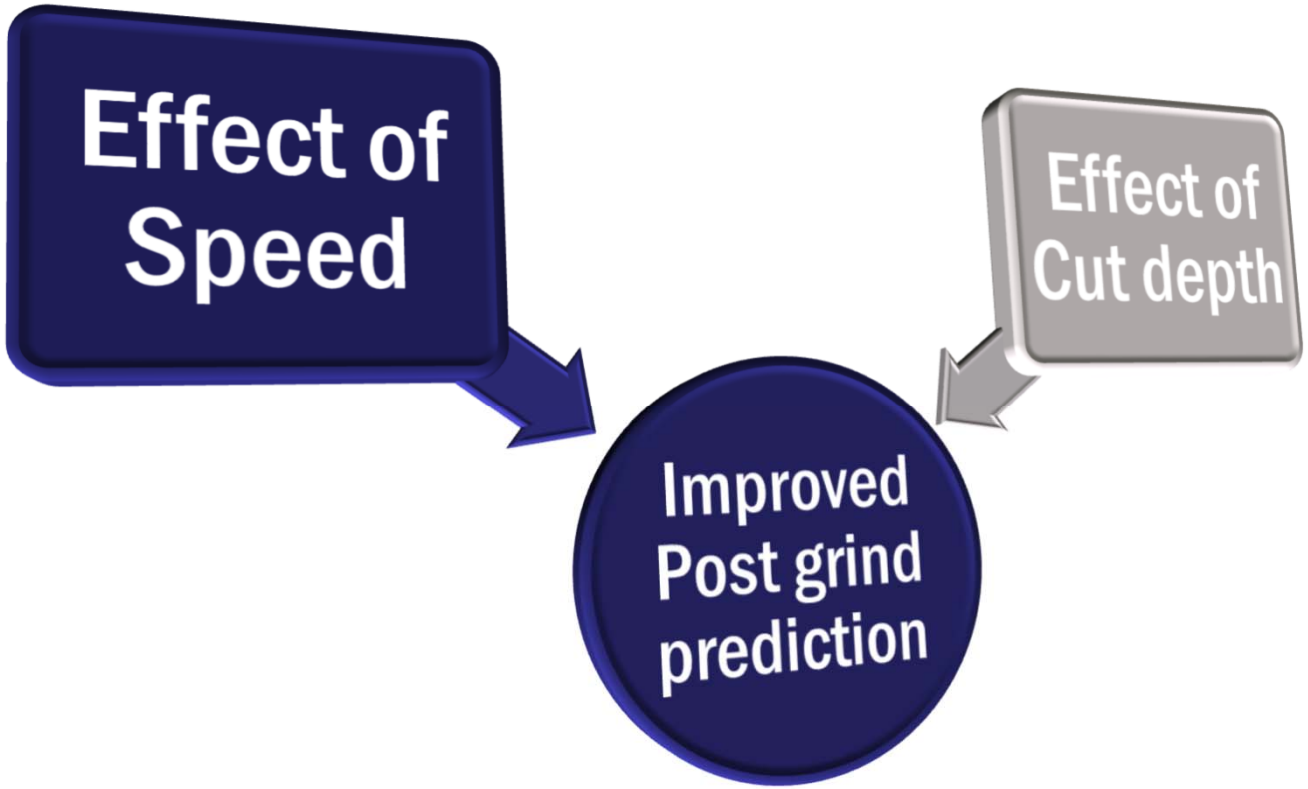
- We had decided to go with a linear objective function that minimizes the total grinding cost.



Predicting Actual Grind Depth



Need for improved grinder models



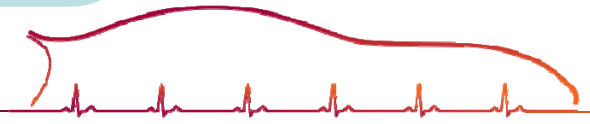
Grinder Models Revisited

If Actual Vertical Force is Less than Force on Grinding Head

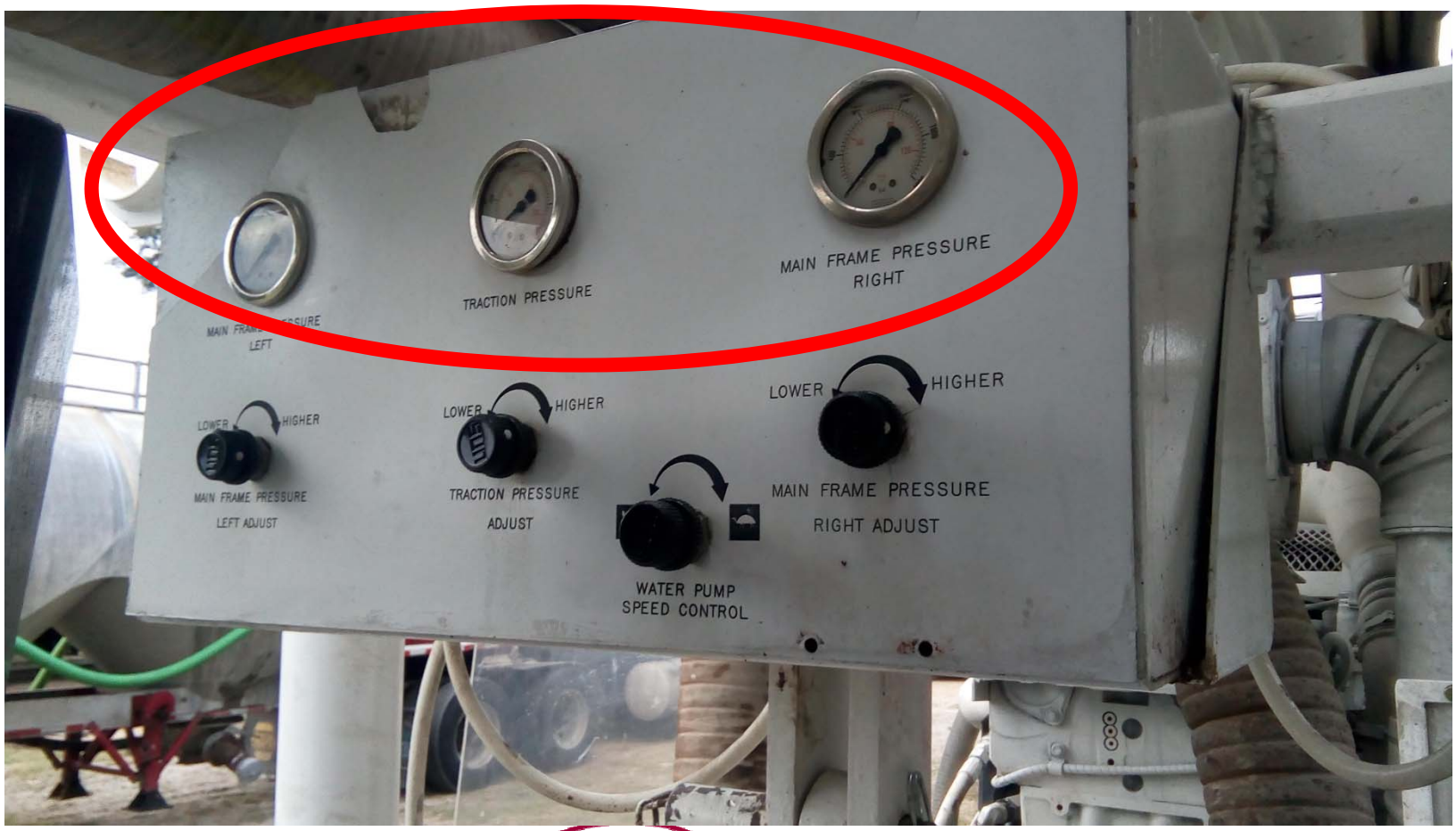
- Normal Operation
- Non Compliant Grinder Model

If Actual Vertical Force exceeds Force on Grinding Head

- High Speed, Heavy Cut
- Compliant Grinder Model



Critical Vertical Force



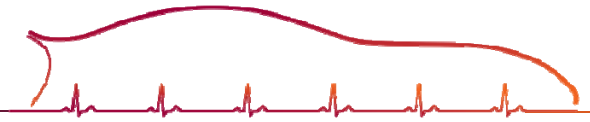
Genetic Algorithms – A Preview

Code Parameter
- This step involves coding the parameters in a binary bit of 0's & 1's

Sample Population
- A initial population is selected to start the algorithm

GA Operations
- Initial population undergoes reproduction, crossover and mutation to improve population

Termination
- The GA is terminated once convergence of successive populations are achieved and a minimum number of populations is reached



Example Genetic Alogorithm

Total Population – 256 possible alternative
Initial Population – 4 random alternative

- 11001011 - 8
- 11100010 - 6
- 01101001 - 18
- 00100111 – 13

The fittest of the population are combined for fitter offspring's

Summary

- The grinding simulator being developed in this work addresses the major drawbacks of available grinding simulators by having a constraint cost function based grinding strategy.

- Also the development of a complaint grinder model will result in accurate post grind surface prediction.

Thank You!

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