R·I·T FORMULA SAE RACING TEAM

Lightweight Fuel Efficient Engine Package

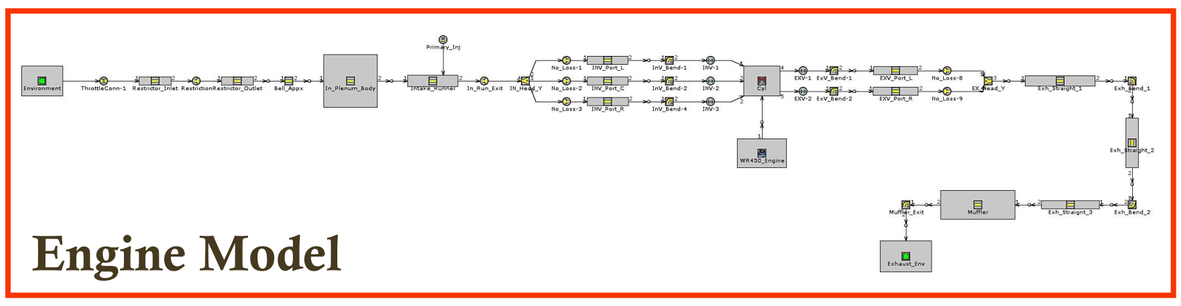
P12221

Introduction and Background:

In order to enhance the RIT Formula SAE Team's score at competitions, developments were needed in the following categories: Design, Endurance, and Fuel Efficiency. To achieve improvements in these scores, a well documented engine package was desired that would provide increased fuel efficiency while still producing a competitive amount of power and durability.

Objective - Scope - Deliverables

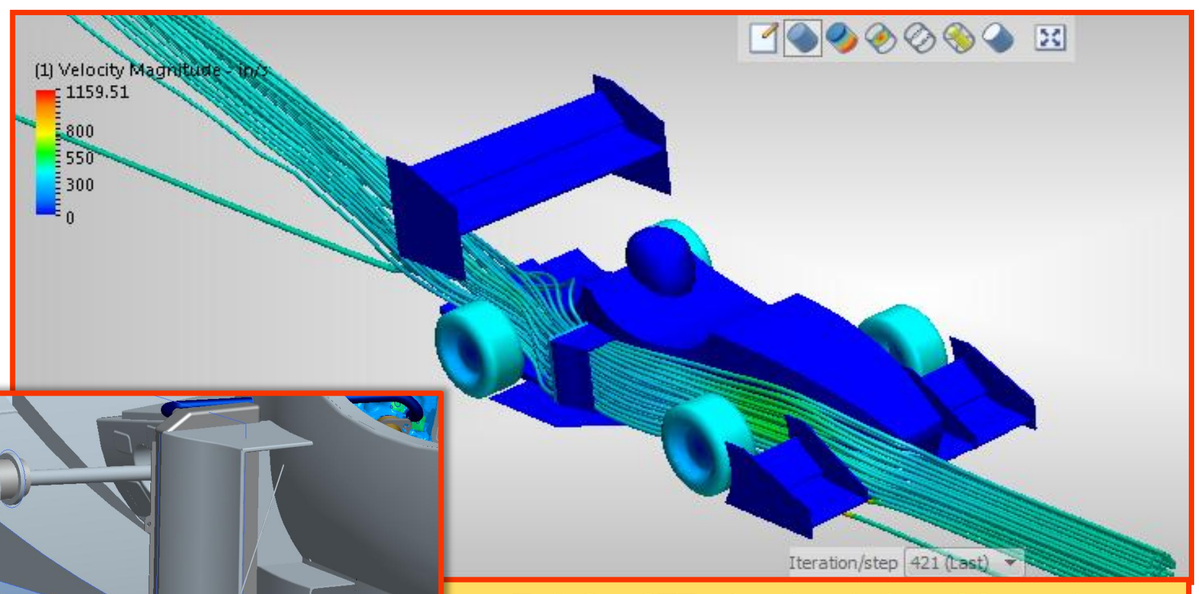
- Design engine package to
  - Reduce fuel consumption by 60% over previous years
  - Provide at least 50 horsepower
- Design cooling system to operate in ambient temperatures of 100°F under race conditions
- Provide a well documented development process and test plan with
  - Complete engine model
  - CFD analysis



Engine Model

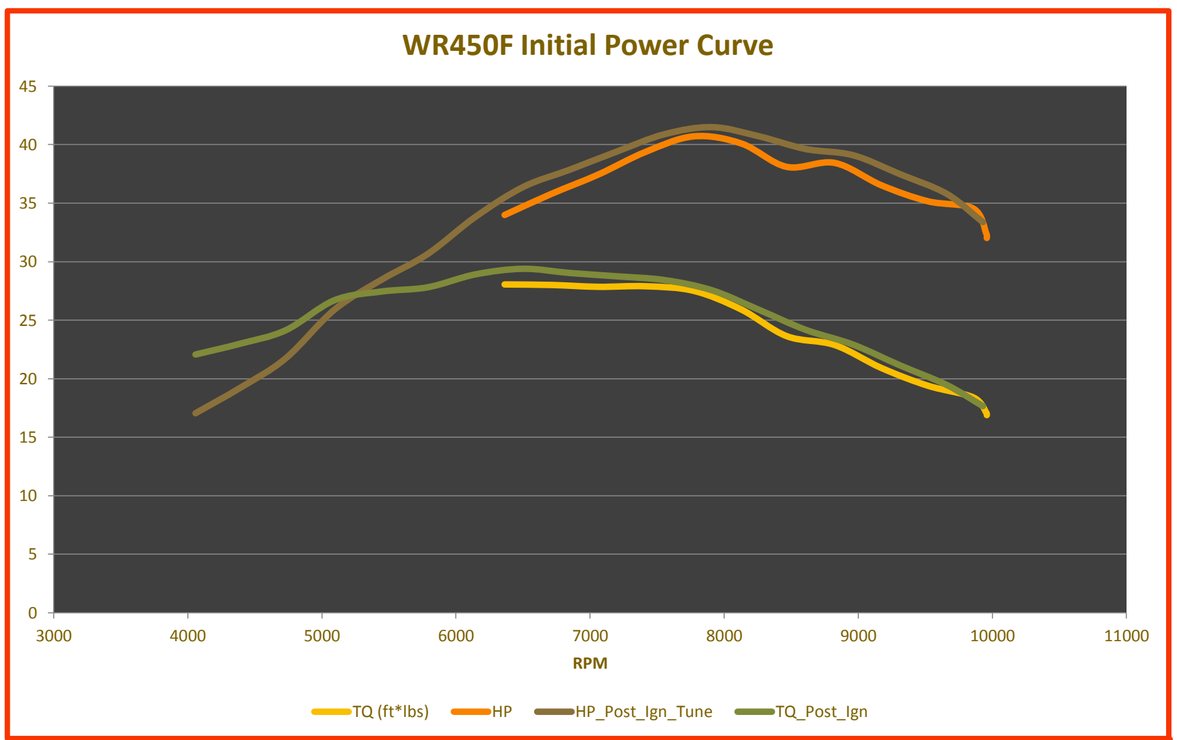
Engine Design – 2009 Yamaha WR450F

- Intake runner lengths were varied in 2" increments from 6" to 10"
- Cam profiles and valve flow were measured at Mercury Marine
- Engine driven by the dyno without fuel, and with a simplified exhaust and intake runner
  - Measures frictional and pumping losses

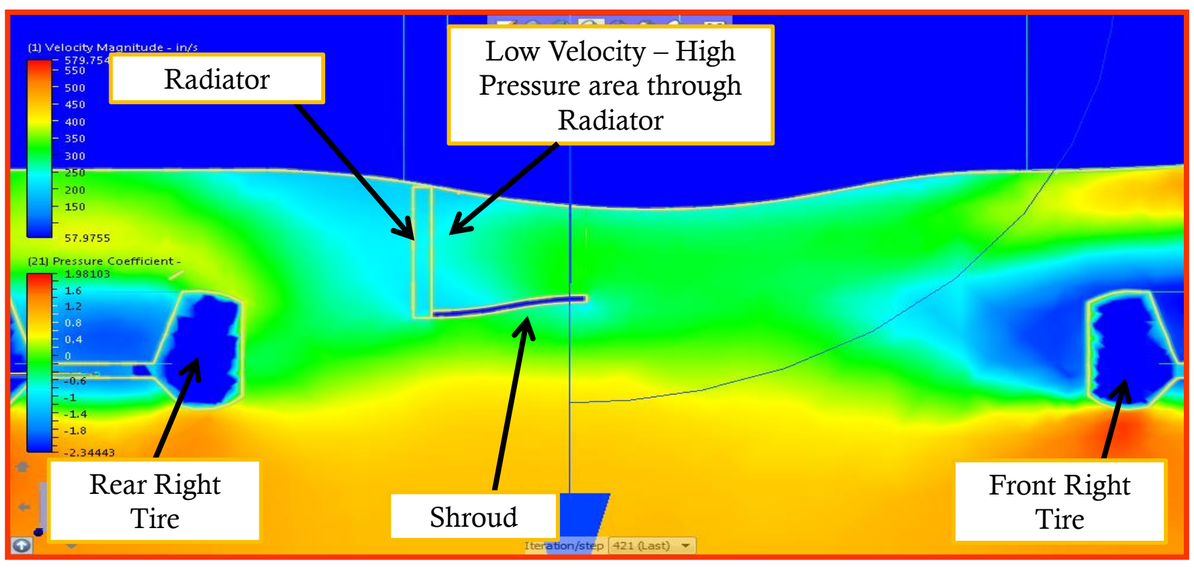


Full Car CFD, showing design of front wing funneling air between endplate and chassis into ducts

Orthographic detail of cooling system, showing inlet of both ducts leading to radiator



- Initial fuel map created with conservative timing
- Ignition timing advanced to find knock limit
- Knock was not noticed using 93 octane fuel, therefore engine was run at MBT
- High compression piston added 4% increase in power
- Hot Cams aftermarket camshaft provided up to 33% increase in power



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Final Design

- Engine power peaked at 42 HP after fuel and spark tuning
- Intake tuning changed peak power RPM, but did not increase overall max power
- Performance cams and piston were evaluated in GT-Power: theoretical increase of 8 HP
- Components were purchased during SDII, but will be evaluated during future testing

Engine Testing on Dyno