FIU Department of Mechanical and Materials Engineering

SENIOR DESIGN ORGANIZATION SYNOPSIS – SPRING 2013

RACE ENGINE OPTIMIZATION
A PROJECT SPONSORED BY CREATIVE PROJECTS

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Formula SAE is a competition in which university teams compete with formula-style, open-wheel race cars that are designed and constructed by students. The competition rules strictly regulate the design for homologation purposes. Among these restrictions are the requirements that all engines displace less than 610cc per cycle and that all intake air pass through a 20mm restrictor. Our design objective is to adapt a motorcycle engine to properly function under the competition operating conditions.

The competition rules allow for 100-octane fuel to be used. This fuel allows for a higher compression ratio to be reached before mixture detonation occurs. The street-legal motorcycle engines typically adapted for this competition are designed with compression ratios optimized to run on widely-available “pump” fuels rated as low as 87-octane. The addition of the 20mm intake restrictor further lowers the effective compression ratio. These competition regulations result in combustion conditions being far from optimized to extract maximum power from the fuel available.

There are several ways to increase dynamic compression ratio of an engine. In un-restricted race classes, it is popular to employ forced induction, which compresses the intake air before its introduction to the engine, also increasing effective displacement. Because the intake restrictor effectively limits the air flow, we intend to modify our engine to more efficiently use the oxygen – and by extension, the fuel - that is available by lengthening the engine’s stroke and reducing the combustion chamber volume.

The engine is to be designed with the anticipation in mind that it will be adapted for use in the next car designed by the Panther Motorsports FSAE team. The accompanying documentation will be written to facilitate its use by future teams for the optimization of any comparable engine.