

Balancing Slow Speed Reciprocating Engines

The Old and the New

JUL 25 Technical Training
Engine Analyzer & Reliability
Workshop – GMRC >
In-Person Workshop



Safety

Always complete a Job Safety Analysis (JSA) before entering the work area. It should include but not be limited to:

- Hazardous atmosphere
- Toxic chemicals
- Flammable gases & liquids
- Low headroom
- Slips, trips, or fall hazards
- Extreme surface temperatures
- High pressures
- Pinch points, rotating parts
- Overexertion
- Poor visibility, weather, noise
- Required PPE condition

Engine Concerns

- Ignition
- Fuel
- Combustion
- Mechanical condition
- Lubrication
- Cooling

Combustion Types (2&4 Stroke)

- Normal ignition
- No ignition
- Early ignition
- Late ignition
- Detonation
- Pre-ignition
- Intermittent firing

Balancing Methods

Peak Firing Pressure (PFP) is the most common balancing method – probably due to the history of balancing – it was easy to measure. It is accomplished by measuring the peak firing pressures of all the cylinders, calculating the mean of those pressures, and adjusting the firing pressures as close to that mean pressure as possible

Peak Pressure Ratio (PPR) is a method suggested in EPPL / SWRI / DOE study in 2008. In this method, the PFP and the unfired Compression Pressure (C_p) of each cylinder is measured. The PFP is divided by the C_p and the PPR Ratio is calculated.

The compression pressure is an indication of how much air is trapped in the cylinder. Since we cannot change that, by inputting the proper amount of fuel into each cylinder, we can control the equivalence ratio, which greatly influences the combustion process.



SCAN for Presentation Handout

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Notes

Presenters

Bryan Stewart, Bryan has over forty years of experience with engines and compression, starting his career as an Application Engineer with Ingersoll-Rand Company in 1978. He was one of the original founders of MMS and was instrumental in the design of Snapshot, ProBalance and ProBalance Plus. Bryan is CFO & VP Sales for Machinery Monitoring Systems, LLC

James (Jim) McCoy, has been in the industry for over forty years, much of that time with Tennessee Gas Pipeline on the original Clean Air Team that pioneered much of the industry's answer to reducing emissions on large, natural gas fueled engines. Was instrumental in getting the engine lab at CSU started in the late 80's-early 90s. Also spent time with Hoerbiger Engine Solutions, some time in the diesel engine arena, and most recently as a consultant to Radical Combustion Technologies, LLC.

RCT/MMS Press Release

Vienna, VA and Knoxville TN, July 15, 2022,

Radical Combustion Technologies, LLC (RCT) and Machinery Monitoring Systems, LLC (MMS) are pleased to announce they are entering a partnership to improve engine health, reduce engine emissions and improve operating performance for natural gas pipeline compressor engines.



Press
Release