Traditional engines lose efficiency due to piston acceleration and thermal losses.

The Relative Motion Combustion Cylinder addresses this by introducing a floating piston that moves in the same direction as the main piston, competing for space with combustion gases, subjected to combustion forces while modifying the main exposure of the main piston surface to combustion pressure. This creates a dynamic pressure field, increasing efficiency without using additional fuel. Below, we explore the mathematical tools underpinning this innovation, rooted in the "Physics of Time."

The Challenge: Piston Acceleration Losses in Conventional engines, following Otto cycle principles, rely on high piston acceleration for performance, but this increases energy losses (e.g., thermal, friction).

Our two-piston design reduces acceleration time, cutting losses. Converge simulations show that reducing piston speed (e.g., from 26 m/s to 13 m/s) halves acceleration time, doubling the Mean Effective Pressure (MEP) and boosting work output by ~40%. Time as a Field of Energy We propose time as a field, akin to magnetic or gravitational fields, capable of conducting energy. Unlike magnetic fields, felt through physical forces, the field of time requires mathematical analysis to quantify energy changes in dynamic systems.

Our energy equation, E(t) = (1/2) M_f g^2 t, models power output (Joules/sec), where:

- *E(t): Power available for motion (e.g., in a combustion engine).*
- *M_f: Effective mass derived from combustion pressure, adjusted to gravitational units.*
- *g^2: Product of two accelerations (e.g., piston motion and combustion pressure dynamics).*
- *t: Time under acceleration, normalized to a universal value (e.g., 4.9 m/s at t=1 sec corresponds to half Earth's gravity, 9.8 m/s^2).*

In plain English: reducing acceleration time (t) increases power output for the same fuel input, unlike conventional engines that require more fuel for higher speeds. For example, halving t doubles M_f, increasing MEP and torque without complex calculations. Negative Mass and Virtual Physical Distance (VPD) The floating piston displaces combustion fluid, creating a “space void” we model as negative mass (NM)—a metaphor for fluid displacement, not antimatter. This simplifies energy conservation calculations under Newton's laws (F = -m*a, where the negative sign reflects reaction forces reducing energy loss). Similarly, Virtual Physical Distance (VPD) measures stroke distance in open systems, where 1 Joule moves a 1 kg object variably, for a distance more or less than 1 meter, due to field effects (e.g., fluid dynamics).

These tools enable precise design in controlled systems (e.g., engines) and energy calculations in uncontrolled systems (e.g., rockets in space).

Acceleration-Time Clock and Pascal's Law The Acceleration-Time Clock equates time under acceleration (normalized to 9.8 m/s^2) to physical distance, optimizing energy storage and release. We also adapt Pascal's Law as a function of time to quantify energy transfer in the cylinder's open system, enhancing efficiency.

Validation and Impact Simulations (Converge CFD) and lab tests confirm our findings:

- Efficiency Gains: ~40% higher work output and MEP ~180 bars compared to 90 bars in conventional engines.

- Near-Zero non manageable Emissions: Decreasing the piston speed under 15 m/sec eliminates fluid freeze zones and longer stroke time with higher pressure helps a more complete burning.
- Reduced Friction: The floating piston, designed as a skirt around the main piston, cuts friction distance of the main piston by 70%, and lowers maintenance costs.

Our approach, presented at APS 2019 and guided by advisor John Basic Sr., challenges traditional thermodynamics (F = m*a, motion as a function of position) by redefining motion as a function of time. Unlike conventional calculations, our E(t) equation predicts performance instantly, validated by matching simulation results at 0.001-second intervals.

Applications Beyond Engines:

The "Physics of Time" extends to open systems inviting research in space or ocean travel, where NM and VPD calculate energy needs without relying on closed-system tools.

Our water accelerator (patented ~2017) ties gravity, buoyancy, and centrifugal forces, invites further engineering research in time accelerating turbines.

Join the Revolution:

We're seeking engineering talent to build a prototype and advance our findings. Explore our patents US-10781770-B2, US-11352942-B2, EP3728866B1, simulation results, and APS 2019 presentation.

Contact us: ihanna@RelativeMotion.net

References

• US Patents: US-10781770-B2, US-11352942-B2, EP3728866B1

• APS Conference Presentation, 2019 •

Converge CFD Simulations