2-stroke engines are all about power-to-weight efficiency, high RPMs, and simplicity, making them dominant in RC racing, motocross, and other performance applications. Since you're running a **REDS 721 Scuderia Superveloce**, I'll tailor this to high-performance nitro racing engines, but most of these principles apply to all 2-stroke engines.

How 2-Stroke Engines Work

Unlike 4-strokes, which complete a power cycle in four strokes of the piston, **2-stroke engines complete a full cycle in just two strokes** (one crankshaft revolution):

1. **Compression & Power Stroke:** As the piston rises, it compresses the air-fuel mix in the combustion chamber. At TDC (Top Dead Center), the glow plug or spark plug ignites the mixture, forcing the piston down.
2. **Exhaust & Intake Stroke:** As the piston moves down, it uncovers the exhaust port, expelling burnt gases. At the same time, the crankcase is pressurizing a fresh charge of air-fuel mix, which enters as the transfer ports open.

This design makes them:

- **Power-dense** (fewer moving parts, firing every revolution)
- **High-revving** (in RC engines, up to 40,000+ RPM)
- **Less efficient** (since intake and exhaust happen at the same time, some fuel is lost)

Getting Maximum Power from a 2-Stroke

If you want to squeeze every ounce of performance from your nitro engine, you need to focus on **airflow, fuel tuning, ignition timing, cooling, and exhaust optimization.**

1. Carburetor Tuning

- The biggest key to 2-stroke performance is perfect **air-fuel mixture**:
    - **Lean = More Power but Higher Temps**
    - **Rich = Cooler but Slower Response**
- **High-Speed Needle (HSN):** Controls the fuel mix at full throttle. Lean it slightly to increase top-end speed but avoid running too lean (engine will overheat and bog down).
- **Low-Speed Needle (LSN):** Affects idle and acceleration. Adjust for smooth response off the line.
- **Idle Screw:** Adjusts the idle RPM.

Pro Tip: Listen for a crisp, clean throttle response. A slight trail of smoke at WOT (wide-open throttle) means it's properly tuned.

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2. Exhaust System (Pipe & Manifold)

The exhaust pipe is one of the most important power factors in a 2-stroke.

- **Tuned Pipes (Resonance Chambers):** Work by using pressure waves to **scavenge exhaust gases** and improve fuel mixture intake.
- **Longer Pipes:** Boost **low-end torque** but reduce top-end.
- **Shorter Pipes:** Increase **top-end power** but sacrifice torque.

For the **REDS 721 Scuderia**, pairing it with a **REDS 2143 pipe** or a **2099 pipe** can boost different RPM ranges.

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3. Cooling & Lubrication

- 2-strokes rely on **fuel mixture lubrication** (usually nitro-methane and castor/synthetic oil).
- More heat = More expansion = More friction = Loss of power.
- Running too hot? **Rich it up slightly** or check airflow around your engine.
- **Properly break in** a new engine to avoid excessive wear (heat cycling method is popular).

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4. Port Timing & Cylinder Head Mods

- Some racers **modify the cylinder ports** to optimize fuel flow (aka “porting and polishing”).
- **Higher compression heads** increase power but require more precise tuning.
- Lighter **ceramic bearings** can reduce friction and improve RPMs.

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5. Fuel Quality & Nitro Percentage

- More **nitro (%) = More power & RPMs** but also more heat.
- Most race engines perform best at **20-30% nitro** (higher nitro means richer tuning).
- **Oxygenated fuels** can improve combustion efficiency.

Signs of a Well-Tuned Engine

✅ **Crisp throttle response**
✅ **Thin blue smoke under acceleration**
✅ **Temps around 210-250°F** (varies by engine)

✅ **No bogging or hesitation**
✅ **High-pitched "screaming" sound at WOT**

Final Thoughts

If you're serious about **getting max power**, experiment with **tuning, pipe selection, cooling, and fuel mix.** Your **REDS 721 Scuderia Superveloce** is already a beast, but dialing in the carb, clutch, and exhaust will make a massive difference in performance.

The ideal **shim thickness** for REDS engines depends on the **nitro percentage** you're using and whether you're running a **buggy or truggy** setup. Here's what REDS Racing recommends:

Buggy (Off-Road Racing)

- **20-30% Nitro: 0.30mm - 0.40mm shim stack**
- **Lower nitro (below 20%)**: Increase the shim thickness to **0.50mm+**

Truggy (More Load, Higher Temps)

- **20-30% Nitro: 0.40mm - 0.50mm shim stack**
- **Lower nitro (below 20%)**: **0.50mm+**

Why Adjust Shim Thickness?

- **Thinner shims (lowering head clearance)** → Increases compression, boosting low-end torque but generating more heat.
- **Thicker shims (raising head clearance)** → Lowers compression, improving high-RPM reliability and reducing detonation risks.

For **buggies**, you want a balance between acceleration and top-end speed. For **truggies**, since they have heavier tires and more drivetrain load, a slightly **thicker shim** helps with longevity and heat control.

If you're running **30% nitro**, **0.30mm (buggy) or 0.40mm (truggy)** should be a solid starting point.

For your **REDS 721 Scuderia Superveloce** running **30% nitro (TNR Fuels REDS Blend)**, the **recommended total shim thickness is 0.30mm**.

Total Shim Thickness for REDS Engines (30% Nitro)

- **Buggy: 0.30mm**
- **Truggy: 0.40mm** (for better cooling under heavier loads)

How to Check Your Shim Stack:

- REDS engines typically come pre-shimmed with **two or more shims** (e.g., a **0.20mm + 0.10mm** stack).
- You can remove or swap shims to adjust compression, but for **30% nitro**, REDS recommends staying at **0.30mm total** for optimal power, efficiency, and reliability.

Would you like a guide on how to swap and measure your shims properly? 🚀