EPARTRADE Race Industry Now Delivers Technical Deep Dive on Abradable Coatings for Oil Pump Efficiency

EPARTRADE's Race Industry Now webinar series continued to push the boundaries of technical education in motorsports engineering with a highly specialized session focused on **abradable coating technologies and their role in oil pump performance optimization**.

Hosted by **Brad Gillie of SiriusXM (Ch. 90, Late Shift)**, Episode #619 brought together three industry experts: **Andy Suman**, President of Line2Line Coatings; **Ai L. Wood III**, President of DRC Engineering; and **Shaun Visser**, Vice President of PMD Automotive.

The discussion provided a rare, engineering-level look into how **tight clearances, controlled wear, and surface engineering** directly influence efficiency, durability, and parasitic loss in high-performance oil pump systems.

Rethinking Clearances: From Tolerance to Strategy

A central theme of the webinar was the evolution of **clearance management** in oil pumps.

Traditionally, pump clearances are constrained by manufacturing tolerances and thermal expansion considerations. However, the introduction of abradable coatings allows engineers to rethink this paradigm by enabling:

- **Ultra-tight initial clearances**
- Controlled "run-in" wear profiles
- Adaptive sealing under dynamic operating conditions

Rather than avoiding contact, modern designs can **intentionally allow micro-interference**, with coatings engineered to wear predictably without damaging mating components.

This approach effectively transforms clearance from a limitation into a **performance tuning variable**.

Abradable Coatings: Controlled Wear for Maximum Efficiency

Abradable coatings are specifically formulated to **sacrifice themselves in a controlled manner**, creating an optimized sealing interface between rotating and stationary components.

Suman detailed how these coatings:

- Reduce internal leakage paths within the pump
- Improve volumetric efficiency
- Minimize recirculation losses

By tightening the gap between gear or rotor elements and the housing, the pump operates closer to its theoretical efficiency limits.

Critically, this is achieved without the risks associated with traditional tight-clearance machining, such as seizure or catastrophic failure.

Friction vs. Efficiency: Finding the Balance

One of the most technically nuanced discussions centered on the **trade-off between friction and sealing efficiency**.

While tighter clearances inherently increase the potential for contact, abradable coatings mitigate this by:

- Lowering the coefficient of friction at the interface
- Allowing localized material removal instead of hard contact
- Maintaining a stable boundary layer during operation

Wood emphasized that the goal is not simply to eliminate friction, but to **optimize the friction profile** for the application.

“In high-performance systems, it’s about managing where and how friction occurs,” he noted. “You want sealing efficiency without introducing excessive parasitic drag.”

Surface Engineering and Material Compatibility

The webinar also explored the importance of **material pairing and surface preparation**.

Successful implementation of abradable coatings depends on:

- Substrate compatibility
- Coating adhesion and thickness control
- Thermal stability under operating conditions

Visser highlighted that coatings must be engineered in conjunction with the entire system, including:

- Lubrication characteristics
- Operating temperatures
- Load cycles and duty profiles

This systems-level approach ensures that the coating performs consistently across real-world racing conditions.

Beyond Oil Pumps: Expanding Applications

While the session focused on oil pumps, the principles discussed have broader implications across motorsports engineering.

Abradable coatings are increasingly being applied to:

- Turbocharger housings
- Supercharger systems
- Sealing interfaces in rotating assemblies

In each case, the objective remains the same: **maximize efficiency by minimizing leakage while controlling friction and wear**.

A Competitive Advantage Through Precision Engineering

As racing programs continue to chase marginal gains, technologies like abradable coatings represent a significant opportunity.

By enabling tighter tolerances without compromising reliability, teams and manufacturers can achieve:

- Increased mechanical efficiency
- Reduced parasitic losses
- Improved overall system performance

The session reinforced a key takeaway: **performance gains are often found at the microscopic level**, where surface interactions and material science play a decisive role.

For more information, **watch the full webinar here.**