

## THE SUSTAINABILITY CHALLENGE: PTI SUPPORTING A GREENER FUTURE

While the aviation industry today is a small contributor to total global emissions, the high-profile nature of aviation inherently requires our industry to be a leader in addressing how to become carbon neutral by 2050. This objective has challenges. What technology needs to be developed to support new aircraft designs and when will this technology be ready? How do we address carbon neutrality in the existing fleet of over 25,000 aircraft, of which around half may still be flying by 2050?

In looking at these challenges to reach carbon neutrality, one important aspect to be mindful about is the process of fluid management. Whether it is the management of fuels (hydrocarbons, SAF or hydrogen), coolants, air or other fluids, how do we prevent contamination? The risks from contamination are significant – poor systems performance, increased maintenance costs, loss of aircraft availability (readiness) and even aircraft failure.

One near-term solution may be Sustainable Aviation Fuel (SAF). SAF is a critical part of decoupling carbon growth from market growth, provided we can get to production volumes and economics that are cost-competitive. Looking at SAF from a fluid control perspective, the compatibility with the existing industry standard seals and epoxy materials, and the effect of the fluid on the filter media with changes in temperature and viscosity are the biggest engineering issues. PTI Technologies has tested the effect of multiple SAF mixtures on current seals, epoxies and filter media to ensure full performance and compatibility, and we will continue to do so as new SAF products develop.

However, what about new technology for future aircraft designs? Today, we see activity in new propulsion system concepts including batteries, electric, hybrid-electric, advanced engine concepts and hydrogen fuel cells to make aviation more sustainable. All of these concepts still need filtration and fluid flow control for fuel, thermal management, lubrication and air systems to remove contaminants and prolong the life of the systems. PTI Technologies brings our deep filtration knowledge and engineering experience to all of these systems to provide superior technology and designs to enable new propulsion capability.

As the engine OEMs have begun developing advanced engine designs, the supporting subsystems are being pulled closer to the core causing temperature increases and a need to filter fuel above 600°F. New engine designs also require high-speed gearboxes, and these require high-temperature lubrication systems. To meet these tough environments, PTI Technologies is applying our proprietary 421<sup>®</sup> Metal Fiber Media technology to provide fuel and lubrication systems filtration at 600°F or higher temperature, or for use with more corrosive high-speed lubricants.

Another potential propulsion technology for a more sustainable future is hydrogen (either liquid or gaseous) for use in fuel cells or directly in engines. PTI Technologies offers a significant range of filtration capabilities for use with hydrogen, which is comprised of our extensive expertise in “all metal” filtration solutions. This includes sintered metal fiber



media for in-depth filtration, metal mesh media and etched disc filters for surface filtration and metallic propellant management devices to manage the flow of cryogenic propellant.

For electric, hybrid electric and fuel cell systems, thermal management systems are critical to system health and use a variety of different coolants including Ethylene Glycol Water (EGW), Propylene Glycol Water (PGW), Midel<sup>®</sup>, Polyalphaolefin (PAO) and others. These coolants need filtration to remove contaminants, and in some cases, the coolant loop also needs deionization filters to remove ions to prevent coolant breakdown. PTI Technologies is applying our many years of thermal management filtration solutions to a variety of applications including hybrid propulsion systems and fuel cell cooling systems.

The very thin membranes used in hydrogen fuel cells are sensitive to contaminants, which can rapidly degrade performance. This phenomenon necessitates the need for the air stream entering fuel cells be as free as possible of contaminants like ammonia, sulfur dioxide, hydrogen sulfide and nitrogen dioxide, as well as particulates (PM 2.5 and PM 10) and entrained liquids. PTI Technologies first developed special air filtration technology starting in the 1980's for military and space applications, and this work continues today for both military and commercial applications. PTI Technologies has invested heavily in developing special filter media and customized, proprietary adsorbents, and we are applying this capability to air filtration for fuel cells to prolong the life and performance of the fuel cell stacks.

To learn more about PTI Technologies and to discuss how we can apply our filtration technology and capabilities to enable sustainable aviation stop by the ESCO Aerospace & Defense booth in Hall 3, #3331 and meet the team.