

Key Advantages of Foam vs Pleated Filters

Surface Area

The largest possible filter should always be selected to obtain the greatest surface area causing the least pressure drop. By increasing the surface area, the pressure drop value is decreased meaning more free-flowing clean air can enter the inlet system, thus increasing volumetric efficiency of the engine.

Pleated filters will always have more overall surface area than a dimensionally identical foam filter. This is due to the nature of construction of the pleat pack being meticulously folded in a 'zig-zag' shape, compared to a foam filters' uniform smooth profile.

At first this may seem a major advantage from a filtration point of view, however, the larger **cross-sectional area** of the foam makes up for the lack of surface area by arresting various size dirt particles throughout the layers of foam, whereas for pleated filters the filtration is undertaken on the surface of the pleat pack, with little room for particles to displace through the filtration media.

This brings on the next topic of filter performance.

Filter Performance

Both filtration media's efficiency is underpinned by the usage of a dust retaining oil. If the particles were to find their way to the engine's internals, a stark increase in engine wear would be seen under inspection.

Due to pleated filters having a larger surface area, this therefore means that from new - they provide less pressure drop compared to a typical foam filter. However, this comes at a compromise of filtration efficiency which may lead to premature engine wear. Initial unladen performance of pleated filters is marginally better than foam equivalents, however as particles begin to build up between the pleat pack recesses, this blocks up the potential flow area – thus reducing performance. Pleated filters are good at arresting large particles and are more free flowing, but they do allow smaller particles through which could cause increased engine and turbo charger wear.

ITG foam filters combat this issue by using varied PPI foam laminates to arrest particles of different sizes. Foam can be specified with increased flow rates at the compromise of filtering efficiency. By layering different foam densities, filtration efficiency is greatly increased, and pressure drop is kept to a minimum – dependant on how dense the foam of choice is. Foam filters can, depending on specification also capture much smaller debris than a pleated filter and store it in larger volumes; as the particles are able to dissipate throughout the layers of foam without totally compromising flow characteristics. However, blocking the pores throughout the foam layers doesn't have as much of a detrimental impact as blocking the surface of a pleated filter.

In summary, pleated filters perform better than foam from new, but as dirt ingress builds through usage, foam filters can perform better due to their higher dust load-up capacity.

Filter Life

The advantage of both Foam and Pleated filters is that they are serviceable items, and both reduce the need to dispose of as many filters, compared to either an OEM paper element or synthetic woven material.

Due to the performance nature of both filter types, they must be cleaned and re-oiled correctly in accordance with the set guidelines and using the correct products. This is critical to both filtration efficiency and the overall condition of the filter itself. If non-recommended products are used this may damage the filters and decrease efficiency, or worse still damage your engine due to debris caused by the filter decomposing.

A cotton Gauze filter can be extremely hard wearing and durable, but cleaning can be detrimental to the dust arresting characteristics. When you clean a pleated filter, some of the cotton's molecular structure is lost. At first glance, this can often be overlooked due to it becoming more free-flowing – but in fact, it is impeding the filtration efficiency of the unit – which is the main purpose of an air filter. A cotton Gauze filter can be extremely hard wearing and can last up to 500000 miles without cleaning but in harsh environments this is dramatically reduced.

Contrastingly, foam filters are not damaged during the cleaning process and all dirt is easily removed if done thoroughly, leaving the filter as clean as it was when it left the factory. The main risk of decreasing filter life of foam filters is letting the filter oil dry out. Therefore, it is very important to ensure the filter is cleaned and re-oiled in accordance with usage guidelines. The process of the oil drying the foam out makes the foam very brittle and may cause pieces to decompose. However, if the filter is frequently cleaned and re-oiled using the correct procedure; this will be prevented, and the foam filter element will perform as new for many years.

In summary, if you are after a 'fit and forget' approach to your air filtration solution, the Pleated filter would be the optimum choice. However, if you are willing to maintain your filter in regular service intervals, then the benefits of a Foam filter are superior.

The choice is yours !

Filter Weight

This is a factor that may not be an obvious consideration when choosing an air filter – but weight is always an area of improvement, especially for any motorsport competitors or high-performance vehicles. The weight of a pleated filter will always be greater than that of an equivalent foam product, due to the need of an end cap and polyurethane (rubber) which is used to bond the pleat pack to the spinning and end cap.

Foam filters negate the need for an end cap because a foam top can be used instead, making it much lighter. The foam body also weighs considerably less than the pleat pack and supporting epoxy coated metal mesh and the need for PU is also removed entirely – instead, the foam is bonded to the spinning using high strength glue.

	Foam	Pleated
Larger Surface Area (Higher Flow Rate)		✓
Long-Term Performance (Dust Laden)	✓	
Initial Performance (Unladen)		✓
Higher Dust Load-Up Capacity	✓	
Filter Life (When Correctly Cleaned & Re-Oiled)	✓	
Fit and forget filter life		✓
Lighter Filter Weight	✓	

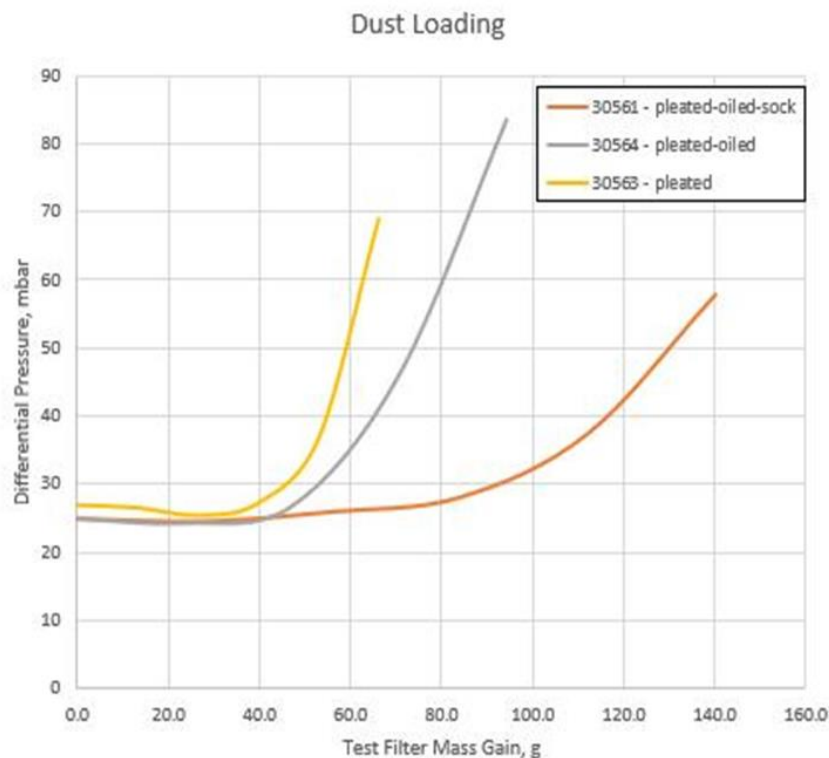
Pleated Filter Research & Development

Thorough testing has been conducted to ensure the pleated filter meets the high standards associated with an ITG product.

An independent dust test has been carried out at Particle Technologies state of the art test facility in the UK to establish the filtration efficiency of the pleated filter. The test results below not only show the importance of oiling a pleated air filter for the retention of dust particles but also the dramatically increased efficiency when paired with the ITG foam technology in the form of an oversock.

Filter Type	Initial Efficiency (%)	Full Life Efficiency (%)
Pleated (Oiled with Foam Oversock)	84	95
Pleated (Oiled)	75	87
Pleated (Dry)	40	45

The addition of the foam oversock not only improves the efficiency of the pleated filter, it also significantly increases the dust holding capacity. This allows the filter to be run for longer before an increase in pressure drop occurs due to blockage. A large percentage of the dust is held in the foam oversock which can be easily replaced to further increase the lifespan of the pleated element.



In addition to laboratory testing the air filters have been put through their paces on the road, race track and rally stage to ensure the filters perform in all conditions.

Throughout 2020 the ITG pleated filter has been rigorously tested by our technical partners Team Dynamics on the BTCC Honda Civic achieving multiple race wins.