

# MIX IT!

GAS MIXING MAGAZINE

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# Mysterious MAP - unexpected item in bagging area!



MAP mystérieuse - objet inattendu dans la zone d'ensachage



Mysterious MAP - unerwarteter Gegenstand im Verpackungsbereich



神秘地图——装袋区的意外物品



MAP misterioso - artículo inesperado en el área de embolsado



You've put a lot of time and effort into your food manufacturing process. You've sourced your ingredients, prepared and processed them to your own high standards and those of your industry and now you've reached the final hurdle – getting them into the hands of your customers in perfect condition and presented in the best possible way to help you stand out from every other product on the shelves. Packaging design is a critically important part of this, it's your brand's message and your differentiating visuals, but it can also be a highly technical challenge too. Modified Atmosphere Packaging (MAP), sometimes known as gas flushing, is one way of protecting and prolonging the shelf life of a huge variety of food items.

Air is all around us and many living things need it to survive, but in contact with food it can allow some undesired processes to take place. Air itself is a mixture of gases, mostly  $N_2$  and  $O_2$ .  $N_2$  is inert, it doesn't easily react chemically and in a biological sense it doesn't promote the growth of aerobic bacteria, yeasts or molds that exist in the food, in Air and all around us.  $N_2$  can almost be thought of as a gaseous void filler and is sometimes used in pure form to provide mechanical protection for fragile items like potato crisps.  $O_2$  on the other hand can interact chemically with the food,

Changing the appearance or causing fats and oils to turn rancid. It also provides a supportive environment for aerobic life to thrive.

If Air is a gas mixture that has some unfortunate properties, then replacing it with mixtures of other, more beneficial gases that can help to prolong the shelf life and maximise profit for retailers is a logical solution, and that's MAP. Common choices for MAP gases are mixtures of  $CO_2$  and  $N_2$  or  $CO_2$  and  $O_2$ .  $CO_2$  prevents bacteria and fungi from reproducing and reacts with water to form carbonic acid. This mild acidity has a preservative effect on the food.  $O_2$  makes another appearance, this time in a positive light. With  $CO_2$  keeping a lid on unwanted bacterial and fungal growth, the ability of  $O_2$  to keep good colouring in red meats can shine through.

In terms of supply modes, MAP gases optimised for specific foods are available pre-mixed in cylinders from all the major industrial gas companies, and for larger food processors gas mixing on site is an option. This can add a further layer of flexibility by allowing you to adjust the MAP gas mixture to suit the unique characteristics of your own products or even to easily allow your existing machines to handle products with differing in-house or retailer MAP specifications.

Now for the mystery – how can the gas mixture measured in the pack sometimes not match the mixture provided by the supply system? Maybe your gas analyser shows the  $CO_2 - N_2$  mixture you expect to see, but somehow there is also  $O_2$ ?

Maybe some of the  $CO_2$  you know is going into the pack has 'disappeared'? It's of course well known that some foods will absorb an amount of  $CO_2$  over time, but if you are seeing problems with packs fresh off the machine, then there may be something else going on. Before delving any further, the first thing to do is to be sure of your gas analysis from the pack. When was your gas analyser last calibrated? Do you have a certified close-tolerance calibration gas at the correct mixture on site that you can check the gas analyser against? If the analyser checks out ok, then the next question to ask is how can the MAP gas mixture change? Quite often, the answer is that the Air you have tried so carefully to exclude is somehow finding its way into the packs anyway. There are some potential causes that are more obscure than others. In the past we have seen cases of foods that have natural internal cavities, for example prepared whole fish, trapping air inside those cavities as they are packed, which is then released into the pack environment contaminating it with Air.



# Mysterious MAP - unexpected item in bagging area!



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神秘地图——装袋区的意外物品



MAP misterioso - artículo inesperado en el área de embolsado

Packing machines often have internal buffer tanks that are replenished between cycles from the wider gas supply system in the factory. Sometimes despite nominally being at a pressure much higher than the surroundings, a leaking pipe can suck in Air if the gas inside the pipe moves at high velocity, for example when re-filling a buffer tank. Probably the most common place for Air to get in though is during the packing cycle on the machine itself.

Think of it this way: your packing machine has a few seconds within the packing cycle to displace as much Air as it can by injecting your chosen MAP gas. There just isn't time for that to happen 100% perfectly, so it's not so much that Air is getting in, more that it is simply not getting removed in the first place. We might call this the Gas Purge Efficiency of the packing machine, something that can be certainly optimised by adjusting the machine cycle but is unlikely to ever be perfect.

We know our mixed gas is 30 'volumes' of CO<sub>2</sub> and 70 volumes of N<sub>2</sub>, but our analyser can only see a CO<sub>2</sub> percentage of 27.3%, so there must be more than 100 volumes of some combination of gases in our pack. If we divide the known volume of CO<sub>2</sub> by its percentage in the pack atmosphere (30/27.3), we learn that there are 1.098 x the number of gas volumes in the pack than we thought. This means we have 100 volumes from our MAP gas, and about 10 volumes of some other gas. The first suspect is going to be Air that hasn't been flushed out by the packing machine or was trapped internally in the food as it was packed.

As a check, what can we learn from the O<sub>2</sub> that has been detected by the analyser?

As mentioned above, Air is a mixture of gases, and that mixture is fairly constant. Near sea level, dry Air is 20.95% O<sub>2</sub>, 78.08% N<sub>2</sub> and the last 0.97% or so is made up of Argon and a handful of other gases in amounts so tiny we don't really need to consider them. If the pack mix has 2.1 volume units of O<sub>2</sub>, and Air is 20.95% O<sub>2</sub>, then (20.95/2.1) we see again that we must have about 10 units of Air.

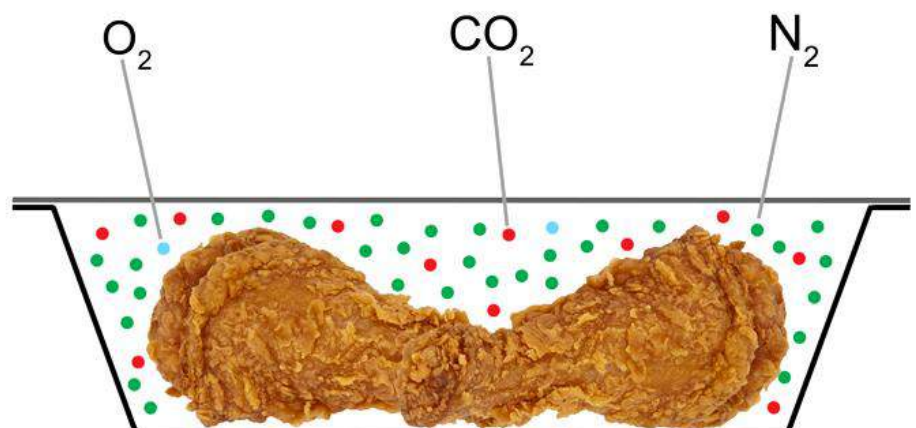
We could say that our hypothetical packing machine has a Gas Purge Efficiency of 91% as it leaves 10 units of Air behind for every 110 total gas units in the finished packs.

The same kind of analysis can be applied to CO<sub>2</sub> - O<sub>2</sub> mixtures for packing red meats. If there is more O<sub>2</sub> and less CO<sub>2</sub> than you expect to find in the packs fresh off the machine, go looking for Air!

Can this be improved? This probably depends on the control system and design of the packing machine itself - maybe the purge time or purge flow rate can be increased slightly, or maybe the machine would benefit from some maintenance intervention or recalibration if this is a new package size?

Another approach, if the O<sub>2</sub> is at or below your accepted tolerances and you just need to get a bit more CO<sub>2</sub> into the packs is to simply increase the CO<sub>2</sub> component of the MAP gas at source until you get where you need to be. A common starting point is to increase the CO<sub>2</sub> component to nearer 33%, giving closer to a perfect 30% in the pack in the worked example above.

In all cases, your food packing machine manufacturer and your gas supplier will be glad to help you resolve these issues.



## LOOKING FOR GAS MIXING EQUIPMENT FOR THE FOOD INDUSTRY?

We have a great range of gas mixing panels and gas analysers that you might benefit from, and they are affordable.



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# Common challenges in mixed gas distribution systems



Défis communs dans les systèmes de distribution de gaz mixtes



Häufige Herausforderungen in Mischgasverteilungssystemen



混合气体分配系统的常见挑战



Desafíos comunes en los sistemas mixtos de distribución de gas

Even those without a day-to-day technical knowledge of Gas Distribution Systems can appreciate what a high-pressure gas cylinder is. They are very common in the food, beverage and of course most manufacturing facilities. People also see smaller units in their homes for O<sub>2</sub> for example and more recently now, many have a greater understanding of the importance of O<sub>2</sub> cylinders in hospitals.

Gas cylinders are of course available in many different sizes and weights and are filled with a range of gases and increasingly, all sorts of gas mixtures. Mixtures of CO<sub>2</sub>, N<sub>2</sub> and sometimes O<sub>2</sub> for the beer, beverage and food packing applications. Mixtures of CO<sub>2</sub>, Argon, Helium and H<sub>2</sub> for fabrication applications, welding, heat treatment. Mixtures of Helium for leak detection in pipelines. Just a few examples of the many common uses for gas cylinders or bottles.

For those businesses that begin small and evolve organically, industrial gas cylinders are a relatively simple starting point to early production. They are convenient to begin with and readily available from several sources. And the chances are that the mix you require is already a common mixture supplied to many others. But as businesses grow, they may be fortunate to reach a point where gas cylinders don't quite fulfil their new needs. And this can be for a few obvious reasons.

**Cost** is possibly the first factor users begin to question. With gas cylinders you generally pay for the gas inside the cylinder and also the costs associated with rental of the cylinders all the time you have them.

There are most commonly charges associated with delivery of the cylinders and the removal of spent cylinder. You also need to know that you have you back-up cylinders and a steady supply so that you don't run out.

**Convenience** is possibly the next factor to wrestle with. There is the convenience of matching gas cylinder orders against production demand or need. There is the convenience of handling each gas cylinder and getting each cylinder to its point of use. And there is the convenience of trying to control the safety aspects of handling, connecting and disconnecting. The cylinders are heavy, they must not be dropped or damaged, they must be secured, and handlers should have some basic training in these aspects.

**Choice** is also a significant factor. Whilst there are many gas cylinder suppliers, they have their own restrictions, and it is not always possible to obtain the exact mix you need. And sometimes if you can get hold of it, you cannot always get hold of it without paying a premium.

**Continuity** also is an issue. Being able to continue to grow the business using gas cylinders as the source can simply become too difficult, too cumbersome and too labour intensive. The process of supplying cylinders can begin to be a bigger issue than other, more important parts of the process.

These factors are overly simplified of course, but whatever the combination of events or reasons, as gas demand increases, there will be a point at which it becomes interesting to consider being supplied with liquid gases, delivered into gas tanks.

There are again several suppliers that can deliver liquid gas supplies reliably.

Liquid gas supplies are generally delivered on a pre-determined delivery schedule in much larger volumes directly into liquid tank storage systems. The cost basis is quite different from cylinder delivery of course, so this needs to be understood. However, the unit costs for gases is much less the more you use. Also, a lot of the pressures mentioned earlier become much easier for the end user. Often the liquid tanks are away from the main factory or process and much more clearly the responsibility of the gas supplier. So, if the costs stack up for you, liquid gas supplies take a lot of the day-to-day handling away from the end user.

Of course, that still leaves one or two other factors such as choice and continuity to contend with. Having a liquid gas supply of each gas available makes those things easier too.

Once you have your liquid supplies in place, they are either supplied to the plant as they are. Or they can be mixed together, to create the exact mix or mixtures you need for your process.

This is where a Gas Mixer comes in to play to help with continuity and choice.

**Mixed gas choice** - Unlike with premixed gases in cylinders, a Gas Mixer provides the opportunity to choose the gas mix needed for the process. You can either have a pre-set gas mixer or an adjustable mixer. In the beverage/beer industry for example 30% CO<sub>2</sub> in N<sub>2</sub> and 60% CO<sub>2</sub> in N<sub>2</sub> are mixes you can often obtain in cylinder format.

# Common challenges in mixed gas distribution systems



Défis communs dans les systèmes de distribution de gaz mixtes



Häufige Herausforderungen in Mischgasverteilungssystemen



混合气体分配系统的常见挑战



Desafíos comunes en los sistemas mixtos de distribución de gas

Anything else is very difficult to obtain cost effectively. A Gas Mixer will give you a much wider range to choose from. If you need anything between 20% and 80% CO<sub>2</sub> in N<sub>2</sub> for your beers for example, the gas mixing valves will happily provide this, and the Gas Mixer cost should not be affected by the mix required.

The benefit of a pre-set gas mixer is that there is great control over the process integrity. It is deliberately difficult for unauthorized changes to be made. There are often tamper evident labels over the gas mixing valves.

The benefit of an adjustable gas mixer is that the end user can change the mix as they desire to meet different process demands. Food packing companies for example often ask for adjustable gas mixers for different packed products.

When designing a process plant, how you deliver mixed gas variation and still keep control over the integrity of that installation can be accomplished using Gas Mixing Panels.

**Continuity and growth of the process** - This is an important element of any mixed gas distribution system. Whilst there will be a predictable flow requirement to begin with, it is often more difficult to predict future growth and demand. This part of the planning process is difficult because it has a knock-on affect to any equipment installed including the pipelines, valves and regulators, liquid tanks and the gas mixer as well.

With liquid gas supplies, tank sizes can be increased over time and additional pipelines can be added from them to the process as required.

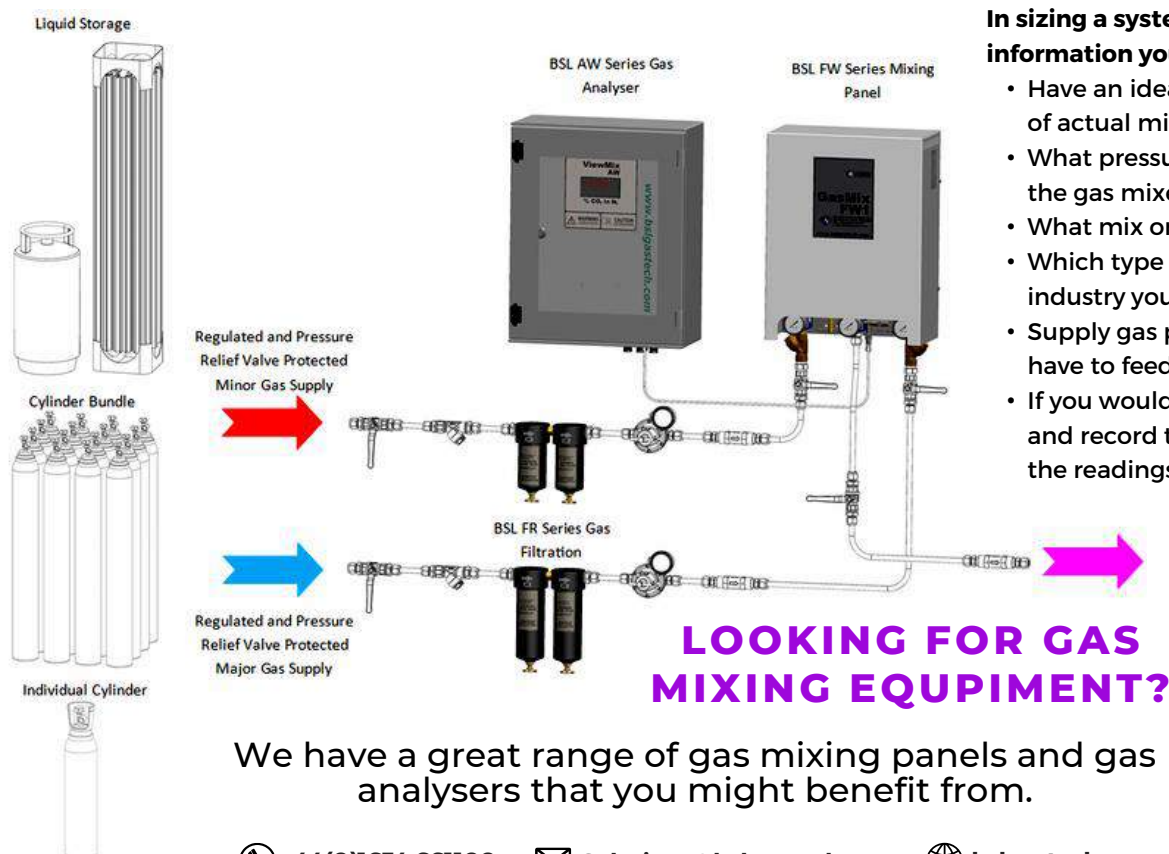
A Gas Mixer can also be easily upgraded as it is possible to add mixing valves into existing gas mixing panels. It is equally easy to add mixing panels to work alongside existing ones.

That way you can install gas mixing equipment as you require it. No need to purchase something much bigger now, for a speculated bigger flow later. It is very common for some companies to simply extend their installations.

The simplest of systems take your pure gases, vaporize them into gases or they may already be gases if they are from cylinders, and provide a regulated and protected supply to a gas Mixer. The mixer then, mixes the gases proportionally as a pre-set or adjustable mixture to give you the mixed gases you need.

**In sizing a system there is some information you need to know.**

- Have an idea of the peak flow of actual mixed gas you need.
- What pressure you would like the gas mixer to deliver.
- What mix or mixes you need.
- Which type of application or industry you are in.
- Supply gas pressures you will have to feed the gas mixer.
- If you would like to measure and record the mix and save the readings.



We have a great range of gas mixing panels and gas analysers that you might benefit from.



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# NO FUNNY BUSINESS.



Protect your gas process from particles or impurities with our Coalescing and Adsorbing Filters.

Efficient, accurate and here for you!



**FILTER OUT THE NONSENSE.**



# Rental Panels - New panel removal instructions



Panneau de location - nouvelles instructions sur la façon de retirer un panneau



Mietpaneele - neue Anweisungen zum Entfernen der Paneele



租赁面板 - 关于如何移除面板的新说明



Paneles de alquiler - Instrucciones de extracción de paneles nuevos

## HOW TO: Remove your gas mixing panel

If you ever need to send your gas mixing panel back to us for refurbishment or calibration, here is how it is done in 6 easy steps!

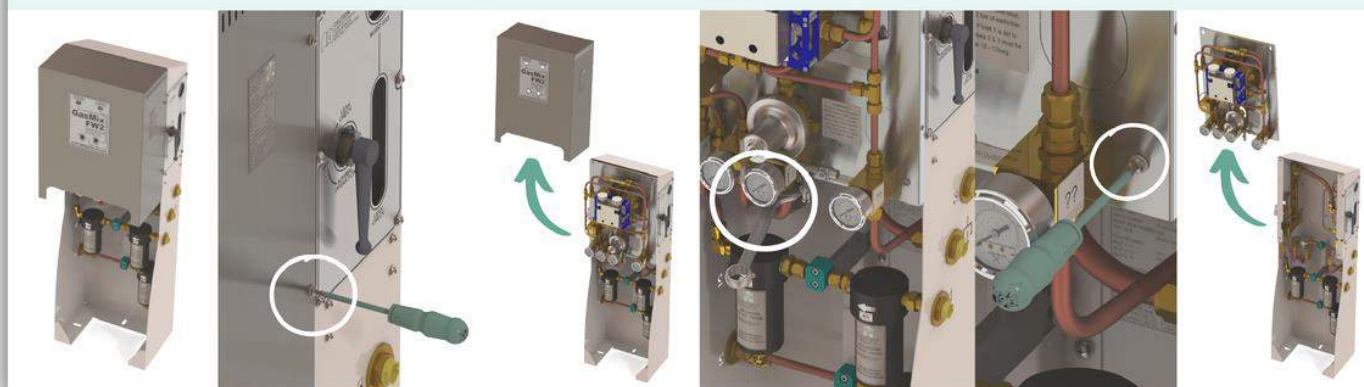
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- 1.** Make sure the gas supply is off to the panel before starting.
- 2.** Take a cross-head screwdriver and undo the screws on the side of the panel.
- 3.** Carefully take the cover of the panel off and set aside.
- 4.** Take a spanner and undo the nuts on the gas inlet pipes and disconnect them.
- 5.** Take your cross-head screwdriver and undo the screws on the back plate.
- 6.** The back plate of the panel should then be able to be removed.



1. Assurez-vous que l'alimentation en gaz du panneau est coupée avant de commencer.
2. Prenez un tournevis cruciforme et dévissez les vis sur le côté du panneau.
3. Retirez délicatement le couvercle du panneau et mettez-le de côté.
4. Prenez une clé et dévissez les écrous sur les tuyaux d'arrivée de gaz et déconnectez-les.
5. Prenez votre tournevis cruciforme et dévissez les vis de la plaque arrière.
6. La plaque arrière du panneau doit maintenant être amovible.



1. 确保在启动前关闭面板的供气。
2. 用十字螺丝刀松开面板侧面的螺丝。
3. 小心地从面板上取下盖子并放在一边。
4. 用扳手松开进气管上的螺母并断开它们。
5. 拿一把十字螺丝刀，松开后面板上的螺丝。
6. 面板的后面板应该是可拆卸的。



1. Stellen Sie vor dem Start sicher, dass die Gaszufuhr zum Panel abgestellt ist.
2. Nehmen Sie einen Kreuzschlitzschraubendreher und lösen Sie die Schrauben an der Seite der Blende.
3. Entfernen Sie vorsichtig die Abdeckung von der Platte und legen Sie sie beiseite.
4. Nehmen Sie einen Schraubenschlüssel und schrauben Sie die Muttern von den Gaseinlassrohren ab. Trennen Sie nun die Rohre.
5. Nehmen Sie Ihren Kreuzschlitzschraubendreher und entfernen Sie die Schrauben auf der Rückseite.
6. Die Panel-Rückplatte sollte dann abnehmbar sein.



1. Asegúrese de que el suministro de gas al panel esté cerrado antes de comenzar.
2. Tome un destornillador de estrella y desatornille los tornillos en el costado del panel.
3. Retire con cuidado la cubierta del panel y déjala a un lado.
4. Tome una llave y desenrosque las tuercas de los tubos de entrada de gas y desconéctelos.
5. Tome su destornillador Phillips y desatornille los tornillos en la placa trasera.
6. La placa posterior del panel ahora debería poder retirarse.



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# MW Mix - Mobile Welding Gas Mixer



MW Mix - Mélangeur de gaz de soudage mobile



MW Mix - Mobiler Schweißgasmischer



MW Mix - 移动式焊接气体混合器



MW Mix - Mezclador móvil de gases de soldadura

## Have you ever needed shielding gases on site, but permanent tanks weren't viable?

Our MW Gas mixing panels are mobile enough to go anywhere you need it to be! That's why it's great for structural steel welding. It can be configured into a high flow welding station with the use of pure liquid gas cylinders mounted on a mobile skid unit.

This one gas mixing panel can supply up to 50 welders. It allows you to have one pre-set mixed gas outlet and a pure gas outlet. Our equipment doesn't require a buffer tank either, saving on space.

You can also save money on your gas cylinders as we recommend using pure liquid gas cylinders as you get more gas for your money.

The mobile skid unit allows you to get large volumes of mixed gas to where you need it, more economically and safely.

This panel comes equipped with an audible alarm in case of mixed gas low pressure. You have a choice of running the alarm internally or externally. Internally, a battery can be fitted to run the alarm system. Or you could run it off an external power supply to a remote alarm repeater, if you wanted.

The MW Mix has pressure relief valves fitted to the inlets and outlets to give your process maximum protection.

This gas mixing panel also has sample points for gas analysis.

The flexi hosing offers durability while traveling around site.

Because this gas mixing panel is designed to be outside, it has some weatherproofing to protect the electrical parts.

The MW Mix uses our proven mechanical mixing technology as its basis in unification with our engineering know how, to give you the best solution.

**SOUND LIKE  
SOMETHING  
YOU'RE  
LOOKING FOR?**

Talk to us and see what is possible!



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Mélangeur de gaz haute pression



Hochdruck Gasmischer



高压气体混合器



Mezclador de gas de alta presión

## Are you working with high flow pressures? Need a gas mixer that can handle it?

Due to various enquiries about gas mixers that can do higher-pressure gas flows, we have designed a specific gas blender or gas mixing valve to handle higher flows of pressure. Our high-pressure gas mixers can now have an inlet pressure of 30 bar g and deliver 25 bar g out. This model of gas mixer is more compact but can deliver greater gas flows.

Available in pre-set mixed gas ratio or adjustable ratio depending on what you need.

We have O<sub>2</sub> clean versions as well as other versions for all common gases.

Our FW range of gas mixers are well established and now are available in high-pressure variations which include FW2HL053RN and FW3HL53VRN.

As with most of our products, it is a fully mechanical design, so it doesn't require electrical power to operate. Nor does it need a buffer tank! It has gas pressure balancing to give you constant flow as well as accurate gas mixing.



**OUR EQUIPMENT  
WORKS WELL  
UNDER  
PRESSURE!**

## Congrats to Chris - 25 years of service!



Félicitations à Chris - 25 ans de service!



Herzlichen Glückwunsch an Chris - 25 Dienstjahre!



恭喜克里斯 - 服务 25 年！



¡Felicitaciones a Chris - 25 años de servicio!

## BSL would like to congratulate Chris Tring on his 25 years continued service with us!

Chris joined us when BSL was short for Beverage Systems Ltd back in 1997. Since that time, BSL have moved to larger premises, trebled our workforce and grown our customer base greatly. Chris has been involved with production and company development and initiated our first ISO 9001 accreditation many years ago.

He has played a great part in our history and is now our Production and Safety Director. He continues to bring his many skills to this role.

Today Chris' biggest challenge is ensuring we have sufficient stock in place to ensure continuous supply of our gas mixing and analysis equipment to our customers.

At the same time, he has to ensure we do this reliably, cost efficiently and in a suitable timescale.

We hope you will join us in thanking Chris for all his efforts over the past 25 years and in wishing Chris all the best for the future!

Thanks Chris!



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# FW6 Mix - Hydrogen Gas Mixer



FW6 Mix - Mélangeur de gaz hydrogène



FW6 Mix - Wasserstoffgasmischer



FW6 Mix - 氢气混合器



FW6 Mix - Mezclador de gas hidrógeno

## Are you working with Hydrogen? Is it for heat treating?

A system integrator came to us to source an accurate gas mixing panel for an end user in the heat treatment industry. We had a good look at our products and realised we could update some of our gas mixing panels to the benefit of this specific customer as well as others. So, we re-designed the FW5 and FW6 to reduce the required difference between the inlet and outlet pressures to achieve peak flow performance.

The system integrator needed a gas mixer for H<sub>2</sub> and N<sub>2</sub>. These gases are used to create an atmosphere around certain types of metal alloys while they are being heated. This heat treatment makes the alloy stronger while eliminating the risk of rust caused by O<sub>2</sub>. The design of this unit was modified as H<sub>2</sub> is being used. Most people may know that H<sub>2</sub> is somewhat lighter than 'air'. Therefore, as a safety feature there is a sheltered vent at the top of the panel.

This gas mixing panel is designed to mix two or three gases by means of a pre-set mixed gas ratio, determined by the customer. The gas mix can be altered if your requirements change in the future. The panel is fitted with 5 or 6 gas mixing valves, depending on the capacity needed.

Our gas mixers work on a pressure balance principle and use mechanical parts instead of those that use electric. As with most of our products, you do not need a buffer tank either.

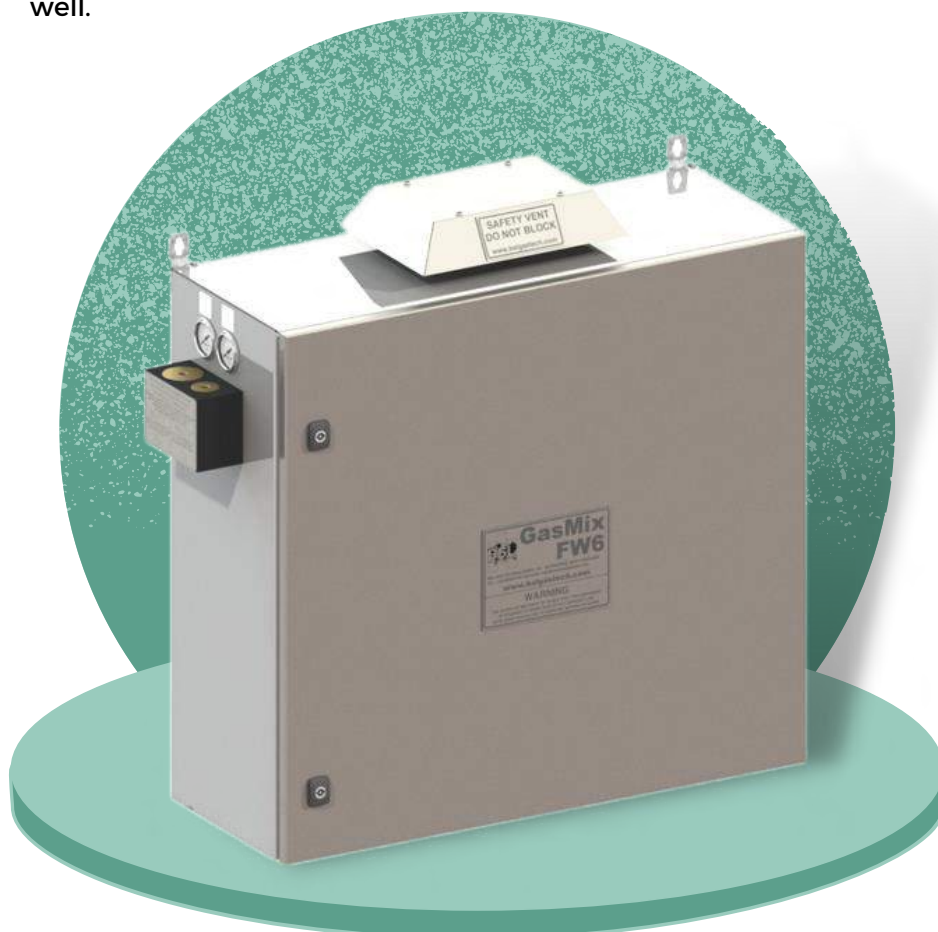
There are various safety interlocks for the gases, especially for H<sub>2</sub> mixtures.

Most of our products don't require a buffer tank or electrical supply, so you can place the gas mixing panel where you want to. At low flows the mix will be H<sub>2</sub> lean as well.

**YOU MAY FEEL  
THE HEAT BUT  
YOU WON'T  
FEEL THE  
PRESSURE!**

Our gas mixing panels keep the pressure under control.

If you have a Hydrogen application with flows of 200 Nm<sup>3</sup>/hr, contact us for more details and options.





# The Original Mechanical Gas Mixer People!



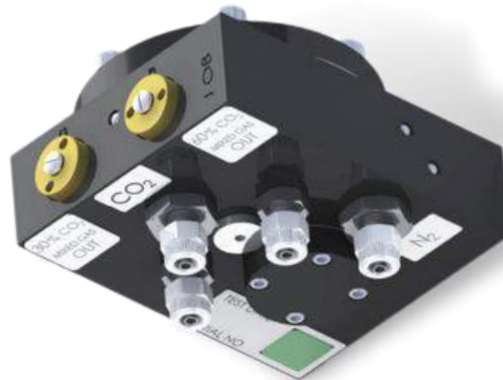
Mix Well, Choose BSL!

## About BSL

We are a gas mixing equipment manufacturer in the UK. We have been around since 1990 and now have a vast range of products for those working with gases. We have customers all over the world with equipment that has been working for years, which is testament to how well our products work.

## Why Choose Us?

A lot of our products come in either pre-set or adjustable gas mixes, giving you the freedom to choose. Most of our equipment doesn't require an electrical supply or even a buffer tank. Therefore, you can put a gas mixing panel where you want it to be. Over the years, we have made a lot of specialist equipment too for many different industries. We have the knowledge to create equipment specifically for your need and gases.



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