



Ikeuchi Europe

いけうち The fog engineers



HUMIDIFICATION CONTROL

- WHAT TO CONSIDER BEFORE CHOOSING A SYSTEM -



SECTION 1 - INTRODUCTION

Humidification control is an often overlooked part of business operations, but it's an important factor for many businesses. Not only can proper humidification help to prevent product failure and machine errors, it also helps to reduce mold, dust, and other allergens, improving air quality and the overall comfort of employees and customers.

A higher level of humidification also lowers the risk of spreading virus significantly and can reduce employee absenteeism by 50% or more. Humidification control should as such not be seen as an expense, but as a valuable investment in your equipment and your employees. Through this report, we will introduce you to the many different types of humidification systems and make you aware of the many benefits which humidification control can have in different types of businesses.



THE PURPOSE OF YOUR HUMIDIFICATION SYSTEM

Before you take on the project of either applying or renewing a humidification system, you should first consider the main purpose of your humidification system. Here is a list of advantages which humidification systems can provide depending on the industry:

- Dust control
- Static electricity control
- Health of employees
- Animal welfare
- Equipment maintenance
- Greenhouse management
- Food and beverage preservement



SECTION 2 - CHOOSING THE RIGHT HUMIDIFICATION SYSTEM



TYPES OF HUMIDIFICATION SYSTEMS

Industrial humidification control is generally divided into 3 branches:

- Isothermal humidifiers (steam humidification above 100°C)
- Vaporizing humidifiers (evaporation by blowing water)
- Adiabatic humidifiers (evaporation with water mist)

Each type has its own benefits and downfalls depending on the purpose and level of expectations. In this chapter, we will describe the different types of systems and try to explore the best option for your specific business.



ISOTHERMAL HUMIDIFIERS

Isothermal humidification is the term used to describe steam humidification. It is one of the most hygienic systems as the use of hot water kills the germs and bacteria while releasing sterile moisture. Steam humidification is in general more silent and will never wet the environment or the objects as no water droplets are sprayed. But the installation of the system will increase the air conditioning consumption and increase the operating costs.

There are different type of steam humidifiers on the market:

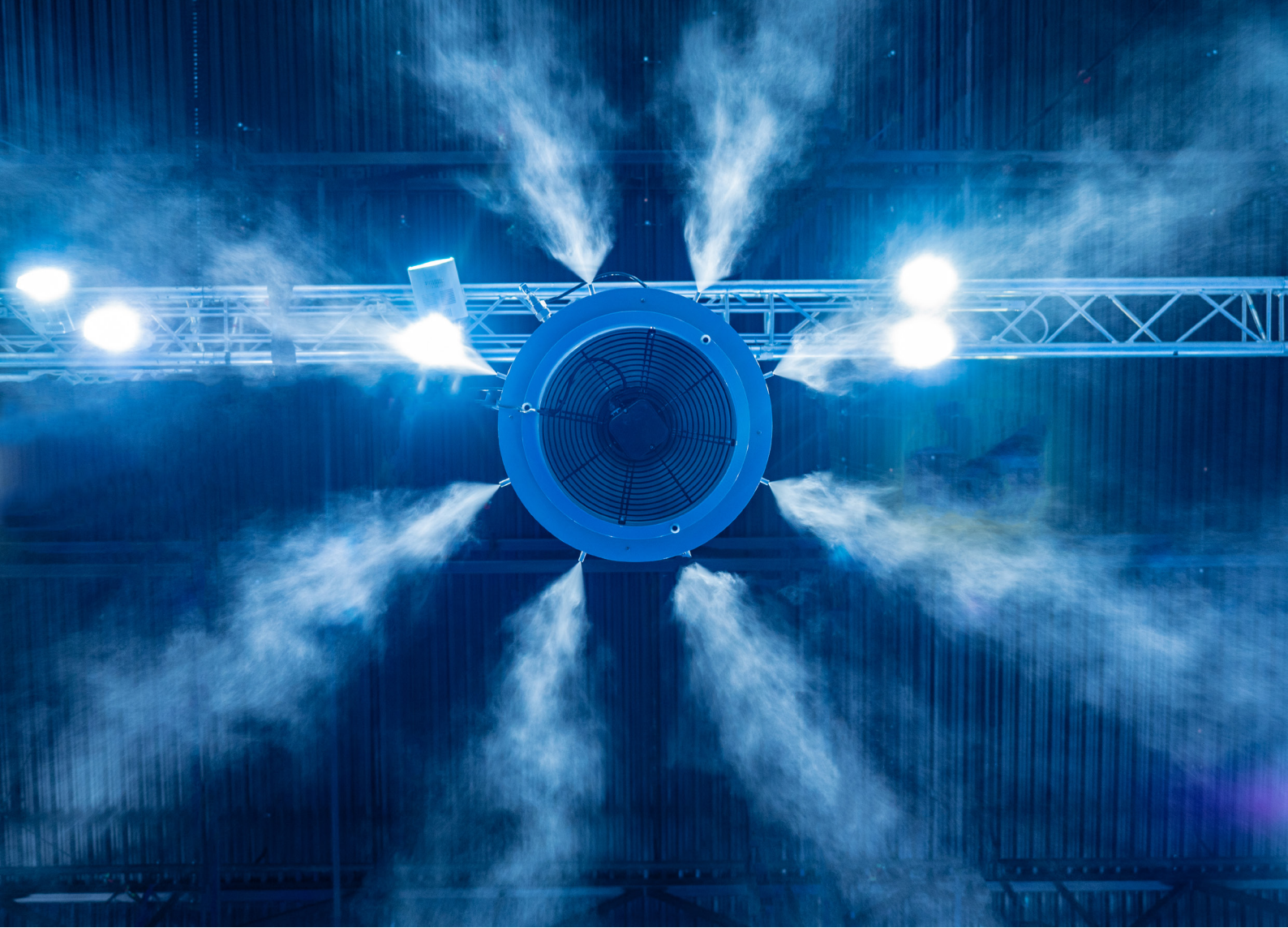
- Steam boiler
- Electrode steam humidifier
- Gas-fired humidifier

THE STEAM BOILER METHOD

The steam boiler method uses a boiler to create steam. This is the most popular and well known among the steam humidification methods. The advantage of this method is that its quiet and the purchase price is relatively cheaper. The disadvantage is its high running costs and CO₂ emission. In addition, it also increases the temperature on site, which can be unwanted in a factory needing cooling due to machines.

THE ELECTRODE STEAM HUMIDIFIER

The electrode steam humidifier is an isothermal humidifier which generates a flow of electrons in order to heat water. This technology makes use of electrical resistance, i.e. the water's conductivity. The advantage of this method is that its quiet and the purchase price is relatively cheaper. The disadvantage is that it needs frequent maintenance and uses a high amount of electricity.



GAS FIRED HUMIDIFIERS

Gas-fired humidifiers rely on natural or LP gas to generate steam inside a coil which transfers heat to water inside an evaporator chamber. The advantage of this method is that it can be used with normal tap-water. The disadvantage is that it requires a lot of maintenance and that steam cannot be produced when a tank is refilling.

VAPORIZING HUMIDIFIERS

- Air washer
- Drop osmosis

Vaporising humidifiers are a more simple and cost efficient way to enforce humidification control. The downside is however that its very difficult to control the humidity levels with this option. An evaporative humidifier is generally located in a duct or air handling unit. Air flows through a continually moistened evaporative matrix and absorbs moisture as it does so.

AIR WASHER

The air washer method blows air with a higher level of humidity by spraying water in the air-conditioner. The advantage of this method is that its energy efficient and don't wet due to no droplets. The disadvantage is however that its very difficult to control the humidity levels and frequent maintenance is needed.

DROP OSMOSIS

The drop osmosis methods uses the air coming in from the outside and increase humidity by dropping water down as it passes. The advantages of this method is also its low cost and energy efficiency. It is however not possible to control the humidity level and there is a risk of bacteria and dirt entering the humidification element.



ADIABATIC HUMIDIFIERS

Adiabatic humidification is the term used to describe cool mist humidifiers. The principle is to release water droplets in the air using an external energy power. As water is sprayed without being heated beforehand like in isothermal, there is a decrease in temperature happening while humidifying. This is the adiabatic cooling effect.

There are different types of cool mist humidifiers on the market:

- Centrifugal humidifier
- Ultrasonic humidifier
- High pressure humidifier (hydraulic)
- Compressed air humidifier (Pneumatic)
- Compressed air humidifier (dry fog)

Using a cool mist humidifier will decrease the costs of air conditioning and lower the operating costs. It also offers a double-edge advantage of humidifying while cooling the environment. And at the same time suppressing dust to reduce the airborne contamination. Within the adiabatic humidification category, there are a variety of different systems.

CENTRIFUGAL HUMIDIFIER AND ULTRASONIC HUMIDIFIER

The centrifugal humidifier is spraying mist by adding drops of water on a rotating plate with high speed while taking in surrounding air by a fan. The ultrasonic commercial humidifier, uses a high-frequency piezoelectric disk to cause cavitation on the surface of the water and thereby produce a fine mist. The advantages of a centrifugal and ultrasonic humidifiers is their low level of energy use. The disadvantages are the risk of bacteria building up in the tank due to the rising water temperature. Another disadvantage is the big droplet size which may wet the surrounding area and machinery.



HIGH PRESSURE HUMIDIFIER

The high pressure humidifier uses a high pressure pumping system to pressurize treated water and pump it to atomizing nozzles. The nozzles reduce the water into droplets which are let out through fan wings. The advantage of this system is the low energy use and that its almost maintenance free with usage of purified water. The disadvantage is the big droplet size which may wet the surrounding area and machinery, but also the risk of water leak due to the high pressure.

COMPRESSED AIR HUMIDIFIER

The compressed air humidifier is using compressed air to atomize the water droplets. The advantage of this method is that its almost maintenance free with the use of purified water. The disadvantage is that it needs a compressor and is less energy efficient. In addition, the big droplet size may wet the surrounding area and machinery.

DRY FOG HUMIDIFIER

The last type of the cool mist humidifiers is “dry fog”. This method is also pneumatic and also uses a compressor to air-stream fine fog out of the nozzle which impinges against another air-stream to shatter into even finer fog. The advantage of this system is that it’s the most energy efficient system. Its practically maintenance-free with the use of purified water and the fine droplets of dry fog will not wet and damage any surfaces or equipment. The only disadvantage is that it requires a compressor.

AKIMist®

IKEUCHI’s dry fog humidifier is called AKIMist® “E”. It is known for its low energy use, non-wetting fog and compactness –It is the size of a small smartphone model. This is an original technology which was invented by IKEUCHI in Japan in 1980 and since has evolved many times. AKIMist “E” was launched in 2008 and is the most efficient air humidifier on the market. One AKIMist “E” can be applied in spaces up to 800m³ and can be used for spot humidification in cases where only a smaller area is in need of humidification. It can also be used for disinfection and sterilization.



SECTION 3 - IMPORTANT FACTORS TO CONSIDER

FACTORS

There are many different factors to consider before you can decide on the most suitable system for your business. Asking yourself these questions will give you a better idea of what is most important in your specific case.

PRICE VERSUS QUALITY

For small business owners, a humidity control system is a big investment and can seem overwhelming. It can seem appealing to go for the cheapest option at the purchase moment. However, when considering lifetime-costs based on running costs, maintenance fees and longevity, the initial more expensive option could be the cheaper option in the long run. The initial purchase cost of a steam humidifier is for instance lower than other options, but the running costs are a lot higher. However, your choice should also be dependent on how important humidification is in your specific case. Is your production dependent on consistent humidity control to avoid product flaws? Is uniform growth important for the plants in your greenhouse? If your business is dependent on humidification to succeed, then you should choose quality over price.

HOW IMPORTANT ARE RUNNING COSTS AND ENVIRONMENTAL IMPACT TO YOU?

Spray system, for instance, generally only uses 1/5 compared to a steam boiler system. Additionally, a steam boiler system is dependent on a boiler which uses crude oil. This also makes the steam boiler system the CO2 emission leader of all options.

HOW MUCH MAINTENANCE ARE YOU WILLING TO CARRY OUT?

There is a great variance in how much maintenance each system requires. Steam systems generally require more maintenance than cold spray systems, but it's also dependent on whether you are willing and able to use purified water or not. In that case, the compressed air humidifier (pneumatic) and (dry fog) require the least maintenance.

ARE THE SURROUNDINGS ALLOWED TO GET WET?

Another important factor to consider is whether you can allow for large droplets or not. Will the humidification system be installed close to machines, paper, food or other substances which need to stay dry and hygienic, then you should avoid a system with big droplets. In this case you can either go for a steam humidifier or the compressed air humidifier (dry fog) where the droplets are as small as fine fog without wetting.

HEAT OR COLD

The choice between an isothermal and adiabatic system can also be dependent on whether you want to cool down your facility or heat it. Isothermal (steam) humidification will increase the temperature on site which you will then need to decrease through your air conditioning system. Adiabatic (cold spray) humidification will on the other hand decrease the room temperature by around 2 degrees. If you have cooling installed in the first place, then this system can be beneficial to further save energy costs.

SPOT HUMIDIFICATION OR LARGER AREA?

Another point to consider is whether you need humidification for a larger area or whether spot humidification in a smaller area is enough. If this is the case then you can save a lot of costs on materials and installation by choosing a method which enables spot humidification.

HOW LONG WILL THE HUMIDIFIERS BE RUNNING AND WHEN CAN IT BE SHUT DOWN?

All humidification systems need to be shut down for maintenance at some point. If your humidification system needs to be running 24/7 then you should either consider a method which requires little maintenance or install standby humidifiers.



SECTION 4 - DETERMINING THE HUMIDIFICATION LOAD



HOW TO DETERMINE THE RIGHT HUMIDIFICATION LOAD

The humidification load is the amount of humidity or water that you should add to the airflow every hour. Humidification is affected not only by the dimensions of the room but also by multiple other parameters such as temperature and ventilation (volume, setup..) Therefore, to pick the perfect humidifier for your industrial environment, it is necessary to know the required amount of humidification and select a humidifier with the right humidification capacity.

VENTILATION RATE

The ventilation rate is the number of times that the whole air of the room is changed. This depends on the settings on your ventilation system. The recommended ventilation rate varies greatly from industry to industry depending on the materials and chemicals involved in the process.

CURRENT HUMIDITY LEVEL

Your current humidity level can be measured by the use of a hygrometer. If you book a free consultation with us we will also measure it for you.

DESIRED HUMIDITY LEVEL

The ideal humidity level generally lies between 40-60% depending on the industry you are operating in. However, in a greenhouse, for instance, plants generally thrive at humidity levels around 70-80%.
When talking about the humidity level, we distinguish between two different terms:

- **Relative humidity**
- **Absolute humidity**



RELATIVE VERSUS ABSOLUTE HUMIDITY

When we hear “Humidity 0%”, it actually represents the “relative humidity”. And the “absolute humidity” is the amount of water contained in the air. If the humidity is 50%, the amount of moisture (absolute humidity) contained in the air varies greatly depending on the temperature at that time (see table below). This means you need to correlate the temperature and relative humidity.

RELATIVE HUMIDITY	AIR TEMPERATURE	ABSOLUTE HUMIDITY
50%	0°C	1.9 g/kg
	10°C	3.8 g/kg
	20°C	7.3 g/kg
	30°C	13.3 g/kg

AIR DENSITY

Air density is determined by Pressure, Temperature, and Humidity. As the temperature increases, the air density decreases. When adding humidity to the air, the air density will also decrease. The air density of a room can generally be found by looking at an air density table where the air density is determined by the room temperature. The air density is for instance around 1.265 kg/m³ at a temperature of 20 degrees and decreases to 1.257 at a temperature of 30 degrees.



SECTION 5 - ADVANTAGE OF HUMIDIFICATION IN VARIOUS INDUSTRIES



AUTOMOTIVE

Our industrial spray nozzles and nozzle-related systems are used in several manufacturing processes in the automotive industry. From the engine powertrain assembly plant to the automobile body plant, the painting/coating line, the bumper line, the outfitting line to electronics of the car. Car manufacturers often experience dust related issues and ESD. These issues can easily be solved by humidification control and often lead to a 100% success rate. This greatly increases the cost effectiveness of the car manufacturer as product waste and product damages are avoided on a an overall costly and time-sensitive product.

ELECTRONICS

PCB and other electronics manufacturers are dealing with complex processes. Therefore, they need to monitor the humidity level to remain at an optimal percentage. This has a direct impact on increasing the quality of their production, minimizing the level of malfunctioning products and reducing possible haphazard incidents to zero. Humidity control is widely used in electronics manufacturing where ESD failures can be as high as affecting 33% of products. With the correct humidification control, the rate of ESD failure can be reduced by at least 70%.

LIVESTOCK

Humidity control does not only provide a healthier environment for humans, it also affects animals in many ways. Especially in the summer time, farms need to control the temperature and humidity levels to avoid heat issues. Humidification and temperature control leads to better hygiene and reduces the risk of diseases. It also leads to better comfort for the animals which reduces their stress levels and increases their production of eggs, milk etc.

TEXTILE INDUSTRY

The textile industry uses humidification control in a number of areas from correct textile storage to dust prevention and machine protection. With the implementation of humidification control, the textiles remains moist which prevents thread breakage and fabric cuts.



HORTICULTURE

Humidity control is extremely important when cultivating plants in greenhouses. A low level of humidity will lead to moisture loss and slow growth or even decrease, while a too high humidity level will lead to mold and bacteria growth. Too humid conditions are also a preferred environment for various pests who will feed on the plants and cause various issues. By installing a humidification system which continuously controls the humidity levels, plants will develop under utmost conditions, reducing waste and increasing growth cycles. In addition, plants will grow at a simultaneous speed, which saves transportation costs as they can all be shipped at the same time.

HUMIDITY CONTROL AND EMPLOYEE HEALTH

Humidity control does not only benefit your production, but also your employees. Having the right humidity level benefits the well-being of your employees and reduces the risk of viruses spreading. This can greatly reduce the employee absence during the wintertime especially.

When the humidity levels are too low, employees can get dehydrated and suffer from allergies and eye irritation. If the humidity level is too high, employees will be more tired and feel less comfortable. There is also the risk of mold when humidity levels are too high, which is also very unhealthy.

Studies have shown that at 30% humidity or lower, the droplets of a person coughing can travel to a distance of 1.8 meter to the nearby colleague. On the other hand, at a humidity level of 60% or higher the droplets will fall and not travel further. The best indoor humidity level is however in between 40-60% which will still have a significant impact on virus prevention. It is however also important to maintain a good air ventilation to renew the indoor air in a closed room.



REQUEST A FREE CONSULTATION

Do you want some assistance to choose the right humidification system?

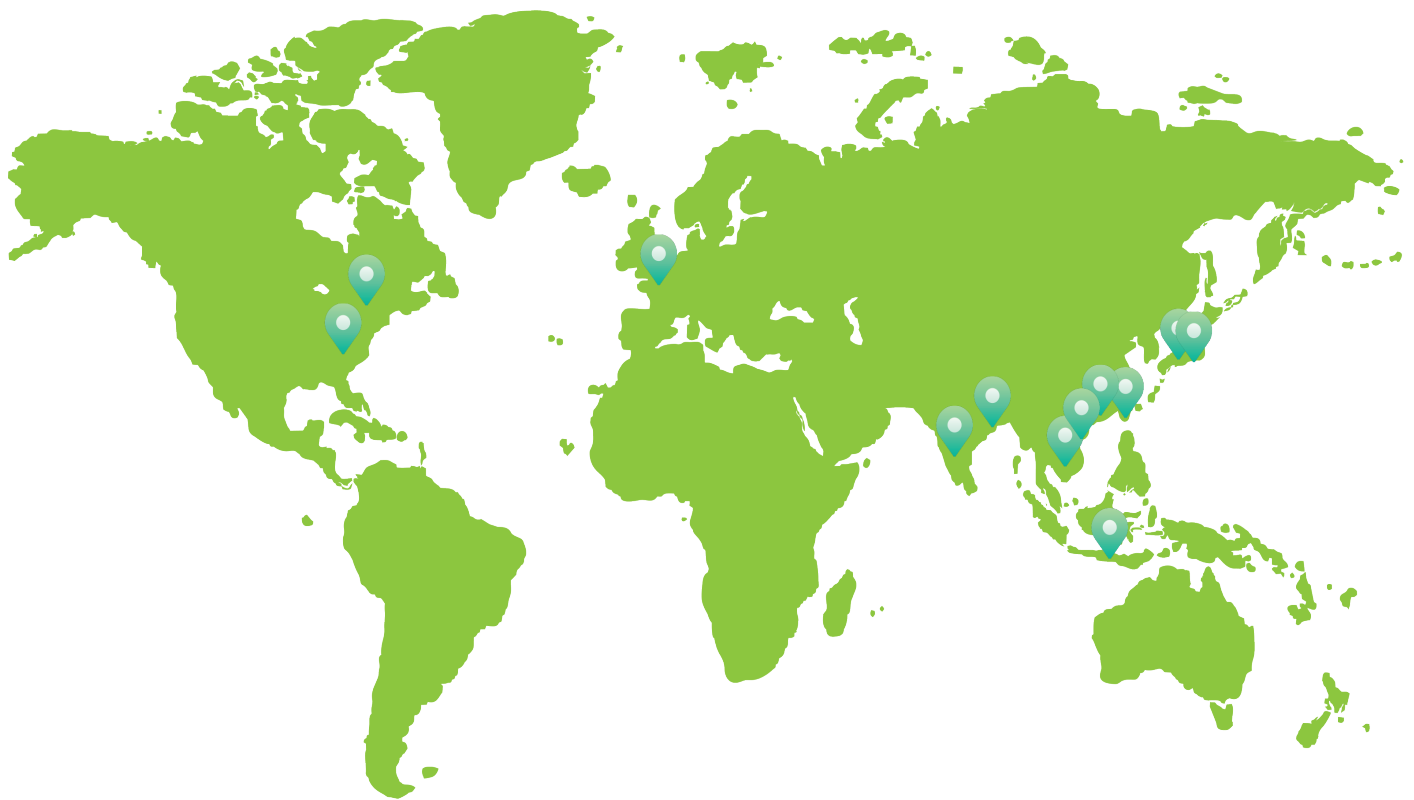
Schedule a visit from one of our humidification experts. We or our distributor in the area will come to your facility and make an assessment of your humidification needs based on the situation.

- We will make an assessment of your humidification needs
- We will give you a demonstration of AKIMist®"E"
- We will give you a price estimation
- No commitment - There is no binding agreement to work with us after the consultation

Please send an email to: Info@ikeuchi.eu

Call us at: T: +31-20-820-2175





Ikeuchi is a Japanese company with branches all over the world. It was founded in 1954 in Osaka and has since then expanded across Asia, North America and Europe.

For inquiries / information requests / quotations related this product, please contact us



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“Taking the path less traveled”

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