

Halton M.A.R.V.E.L.

Intelligent Demand Controlled Ventilation System for Professional Kitchen





13 Coins Restaurant, Seattle, WA USA

M.A.R.V.E.L. Revolutionizing the Kitchen Energy Footprint

The M.A.R.V.E.L. system* is full of technological innovations representing the best expression of the Halton High Performance Kitchen (HPK) concept. This is the first truly intelligent, responsive, and completely flexible demand controlled ventilation (DCV) system specifically designed for exhaust systems. M.A.R.V.E.L., in combination with Capture Jet® technology, offers the lowest levels of energy consumption currently possible and provides complete comfort for users.

The first innovation:

M.A.R.V.E.L. is able to identify the current status of the cooking equipment (switched off, heating to cooking temperature, or cooking in progress).

The second innovation:

M.A.R.V.E.L. has the unique ability to adjust the exhaust flow rate to match these three statuses and, above all, exhaust hood by exhaust hood and in a totally independent manner. If only one of the cooking ranges in the kitchen is operating, the flow rate of that particular exhaust hood will be automatically adjusted to that requirement. The other exhaust hoods or zones will continue operation at a low flow rate.

The third innovation:

M.A.R.V.E.L. is capable of continuously regulating the flow rate achieved with the extraction fans but also, and most importantly, their pressure. By operating at a variable pressure and flow rate, this system enables you to fine tune the equipment to the exact area and overall requirements, with power consumption kept to the absolute minimum. The associated supply fans are also controlled so as to guarantee the air flow balance of the kitchen.

The fourth innovation:

M.A.R.V.E.L. is a totally flexible system. It can be reprogrammed at any time in response to changes in kitchen layout.

M.A.R.V.E.L. was also awarded the 2009 Kitchen Innovations award.



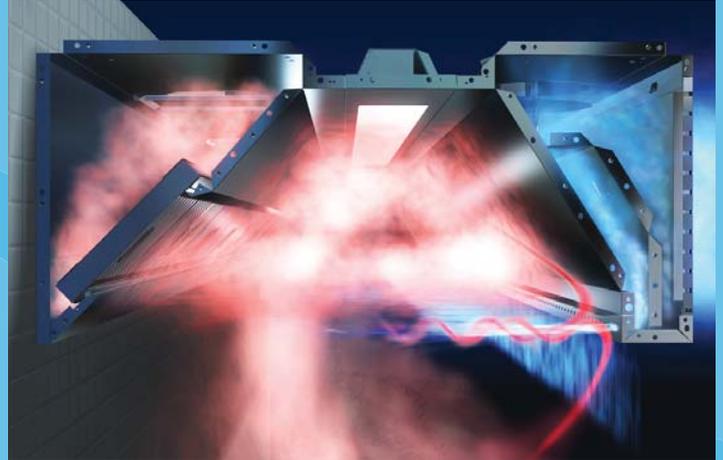
* Modeled based Automated Regulation Ventilation of Exhaust Level

Capture Jet technology: Essential control of capture and containment

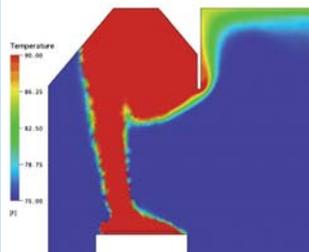
M.A.R.V.E.L.* offers the unique possibility of changing the exhaust and supply air flow rates:

- according to the equipment's activity in real time
- to provide the exact flow required, without compromising pollutant capture efficiency or air quality

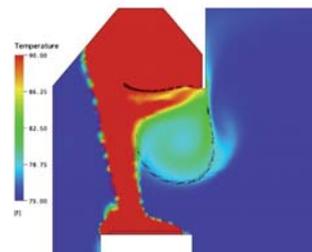
However, M.A.R.V.E.L. does not directly affect the maximum flow rate. Only the hood's own efficiency and a rigorous requirement calculation method enable reliable determination of the maximum flow rate.



WITHOUT Capture Jets



WITH Capture Jets



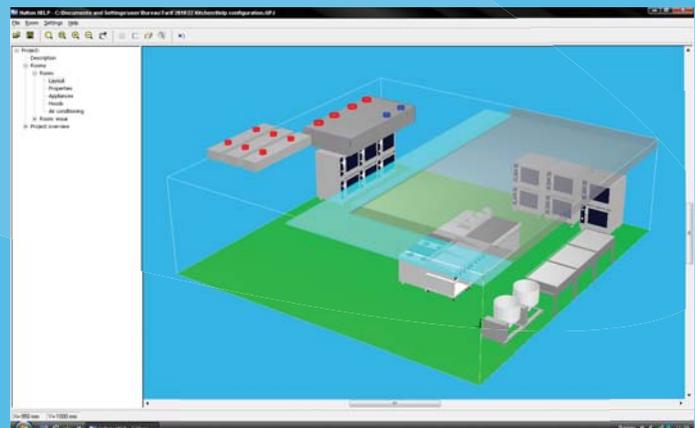
Numeric simulation of the effect of double Capture Jets and peripherals on capture efficiency

Capture Jet technology allows reduction of the maximum exhaust flow rates needed, in comparison to those required with traditional exhaust hoods, by 30 to 40%. M.A.R.V.E.L., when combined with patented Capture Jet technology (double jets and peripherals), enables you to decrease these flow rates further, to achieve a total reduction of 65%. The two technologies therefore go completely hand in hand.

Capture Jet efficiency is determined with exhaust flow rate calculation tool H.E.L.P.

HELP (Halton Energy Layout Program) is a user-friendly graphical tool that calculates exhaust flow rates according to the type of cooking equipment, its power, its installation configurations, and the measured efficiency of the Capture Jets. It performs precise calculation of the convective flows in order to determine the exact flow rate required for exhausting them – no more and no less.

H.E.L.P. guarantees that M.A.R.V.E.L.'s action is reliable from the outset (with the lowest possible maximum flow rate).



Combination of M.A.R.V.E.L. and Capture Jet technology: Rapid, fine-tuned adaptation to the requirements of the equipment.

Kitchen 'energy profiles' can be differentiated by three fundamental factors:

- The daily operation period
- The rate of use of the equipment or simultaneity co-efficient (all pieces of equipment are never all in cooking mode simultaneously)
- The regularity of operation (from regular activity for company restaurants or canteens to occasional operation for kitchens that prepare food for banquets).

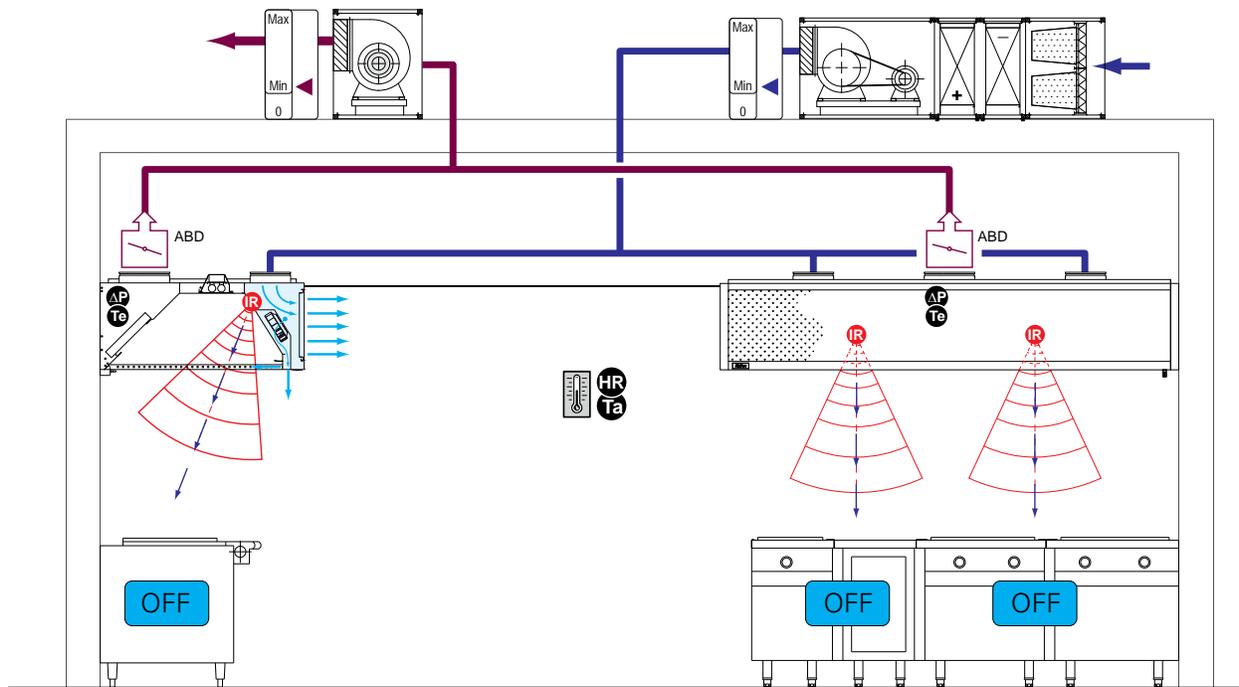
M.A.R.V.E.L. was designed to adapt in an automatic, permanent, and highly responsive manner without human intervention, and to suit all possible kitchen operation settings.

Thanks to the IRIS™ technology (Infrared Radiation Index Sensor, patent pending), M.A.R.V.E.L. continuously measures the actual status of each item of kitchen equipment:

- Switched off
- Heating up to cooking temperature
- Cooking in progress

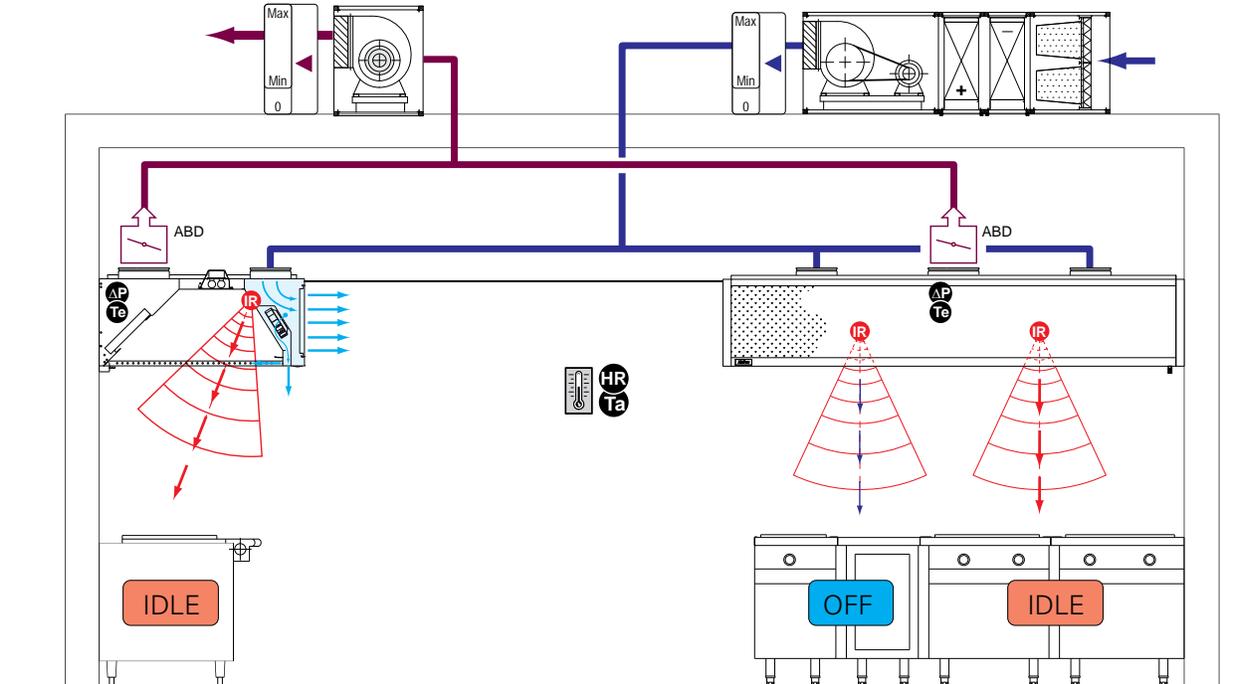
On the basis of the status, and thanks to the ABD UL Listed motorized dampers integrated into the exhaust hood, M.A.R.V.E.L. adjusts the exhaust and supply air flow rates automatically, exhaust hood by exhaust hood or zone by zone (even if all hoods are connected to a single fan).

1 - Preparation of the kitchen



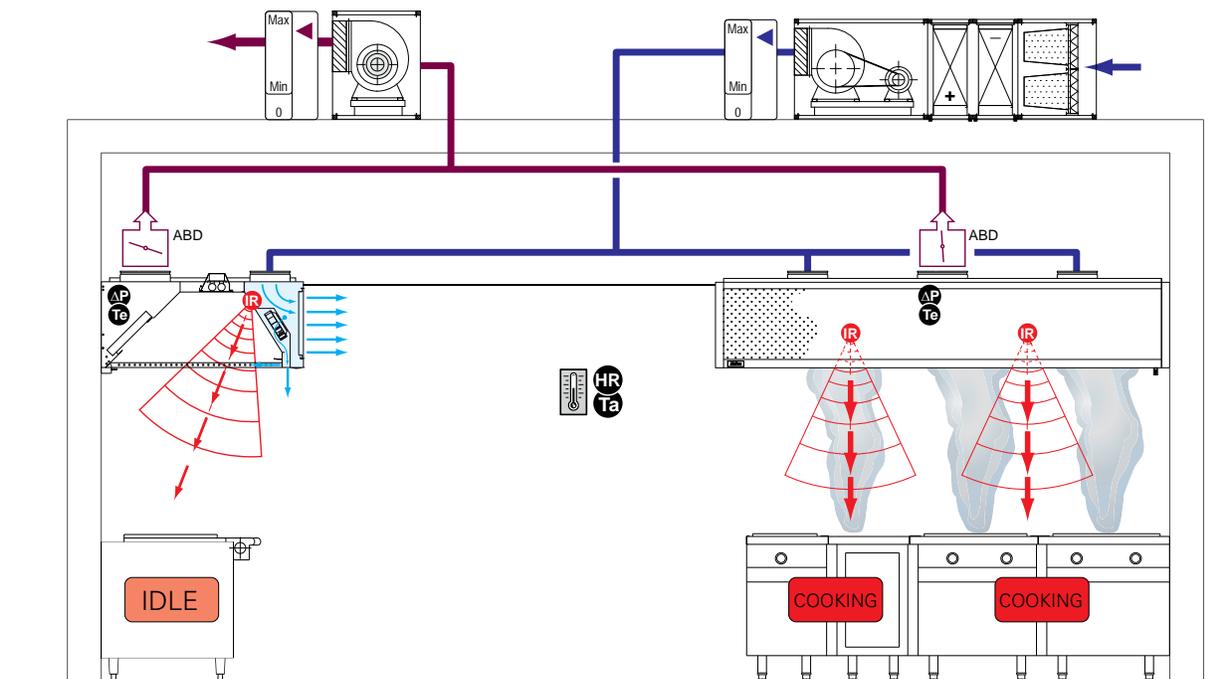
When the kitchen is not in operation, M.A.R.V.E.L. can be programmed to stop the ventilation or to continue it at a low flow rate that keeps proper hygiene maintained during the inactivity. In the latter case, the fans and dampers are automatically adjusted to the minimum programmed settings.

2 - Heating of the equipment



The cooking equipment is gradually heated according to the requirements of the menu to be prepared. The IRIS™ sensors associated with temperature measurement detect the state of the equipment concerned (hot or standby). The system then automatically adjusts the position of each individual damper and the fan speed, in order to achieve the exact flow rate required for each exhaust hood in response to changing requirements.

3 - Full scale activity of the kitchen



When the kitchen is fully active, most of the equipment enters cooking mode while the other equipment generally remains on standby. The infrared sensors once again detect this change in activity, as it occurs. The exhaust flow rate is then automatically adapted to the change in requirements, exhaust hood by exhaust hood in real time.

M.A.R.V.E.L.

Advantages and features:



- Adjustment of the exhaust and supply air flow rates in real time and according to the use of each item of cooking equipment installed in the kitchen.
 - Individual and independent variation of air flow rates, whether the installations are equipped with just one or several fans.
 - A 65% reduction in flow rates thanks to the combination of M.A.R.V.E.L. and Capture Jet.
 - Reduction in the energy consumption related to heating and/or cooling of the fresh compensation air in kitchens.
 - Permanent optimization of the power consumption of the fan motors as a result of the variable air flow rate and pressure regulation.
- Time savings in installation and start-up, thanks to a self-calibration procedure that eliminates complex manual balancing of the air system.
 - The exhaust fan starts up automatically when the cooking equipment is turned on and stops as soon as it is switched off. The system supports minimum permanent ventilation settings. It has a manual, programmed on schedule and automatic on/off function.
 - The temperature and relative humidity in the kitchen can be controlled to ensure optimal comfort and hygiene.
 - The system provides extensive data reporting and connectivity capabilities.
 - Fire safety functions enable extraction to be switched to maximum flow and compensation to be switched off. The dampers are equipped with automatic return to fully open or closed position according to statutory requirements.
 - The air flow control units of the M.A.R.V.E.L. system are part of the common monitoring platform for solutions employing the Halton High Performance Kitchen concept. M.A.R.V.E.L. is 100% compatible with Capture Ray UV technology monitoring systems and EcoloAir Air Purification Systems.
 - The system is pre-set in the factory. Therefore, commissioning, performed by a professional Halton technician, involves only adjustment according to the actual site configurations and the final conditions of use of the equipment.





The IRIS™ sensor

IRIS™ sensors were developed for real-time measurement and control of the thermal signature of each type of kitchen appliance. They emit a beam that can instantaneously measure changes in the surface temperature of the kitchen equipment. The sensors are controlled by our special algorithm that rapidly adjusts the exhaust air flow. Heat and pollutants generated by the cooking activities are then evacuated quickly, efficiently, and appropriately. The canopies can be equipped with 1–4 sensors, depending on their length. The number and position of the sensors may vary to suit each particular cooking range. The sensors are installed on the air supply plenum of the exhaust hood so that the positive pressure provides continuous air curtain over the sensors to keep them clean.

The controllers

M.A.R.V.E.L. uses two types of controller:

- The exhaust hood controller: This controller is built into every exhaust hood and reads the sensors and controls the damper. It monitors the associated kitchen equipment, determines the flow rate appropriate for the current operation, measures the exhaust air flow rate, and operates the damper accordingly.
- The computing system: It collects the information from all of the exhaust hood controllers and controls the exhaust and supply fans. It also handles the auto-calibration procedure during start-up.

ABD motorized dampers (exhaust air)

Each exhaust plenum is equipped with an ABD (automatic balancing damper) motorized damper unit with a return function. The dampers are equipped with two inclined damper blades to reduce the accumulation of dirt and help fat flow away towards the exhaust plenums.

Differential pressure sensor (exhaust hood extraction plenum)

A differential pressure sensor is installed in each hood plenum. The pressure is read at the exhaust plenums in order to allow use of the T.A.B. (Testing and Balancing) co-efficients for products so equipped and to obtain reliable air flow rate readings.

Duct temperature sensor

There is one duct temperature sensor per exhaust hood, installed in the hood collar.

Room temperature sensor

This sensor provides kitchen space temperature measurement.

VFD frequency control device

The Variable Frequency Drive is essential for the M.A.R.V.E.L. system that operates it, for adjusting the speed of the exhaust fan.

User interface (touchscreen optional)

Optionally, the system can be equipped with a touchscreen installed in the kitchen. This offers a very user-friendly way of accessing the system, allowing the settings for both the M.A.R.V.E.L. system (controlled access) and other Halton integrated control systems.

Online monitoring

Standard for systems with IP addresses, other optional monitoring services for kitchen environments available.

Halton – Enabling wellbeing in indoor environments

Halton is a family owned company specializing in indoor climate and indoor environment products, services and solutions. Halton's aim is to create comfortable and safe indoor environments with energy-efficient and sustainable life cycle.

Halton solutions range from public and commercial buildings to industry, commercial kitchen and restaurant applications. Halton is also one of the most recognized indoor climate solution providers for marine and offshore applications. Areas of expertise and product ranges cover air diffusion, airflow management, fire safety, kitchen ventilation, air purification and indoor environment management.

Halton operates in 23 countries around the world. Headquarters are located in Finland and in the USA. Production facilities are located in Finland, France, Germany, Hungary, the UK, the USA, Canada and Malaysia. Indoor environment laboratories are located in the USA, France and Finland.

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