

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

Demand Control Kitchen Ventilation...and More!



Halton Foodservice specializes in indoor climate solutions for commercial kitchens and restaurants.

Our expertise, flexibility and proprietary technology enable us to create memorable customer experiences and pleasant working environments, which increase the profitability and productivity of food service operations around the world.







# The M.A.R.V.E.L. Innovation that is Revolutionizing the Kitchen Energy Footprint

## The 1<sup>st</sup> 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 2<sup>nd</sup> innovation:

M.A.R.V.E.L. has the unique ability to adjust the exhaust flow rate to match these three statuses

- Each exhaust hood functions independently from the other.
  - 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 3<sup>rd</sup> innovation:

M.A.R.V.E.L. is capable of continuously regulating the flow rate achieved with the exhaust fan(s) 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 energy consumption kept to the absolute minimum. The associated replacement air fan(s) are also controlled so as to guarantee the air flow balance of the kitchen.

## The 4<sup>th</sup> innovation:

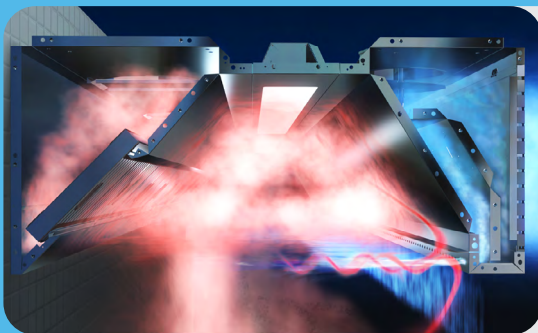
M.A.R.V.E.L. is a totally flexible system. It can be reprogrammed at any time in response to changes in the appliance line up.

M.A.R.V.E.L. has been awarded Energy Star status and Emerging Technology Award from the U.S. Environmental Protection Agency.

\* Modeled based Automated Regulation Ventilation of Exhaust Level



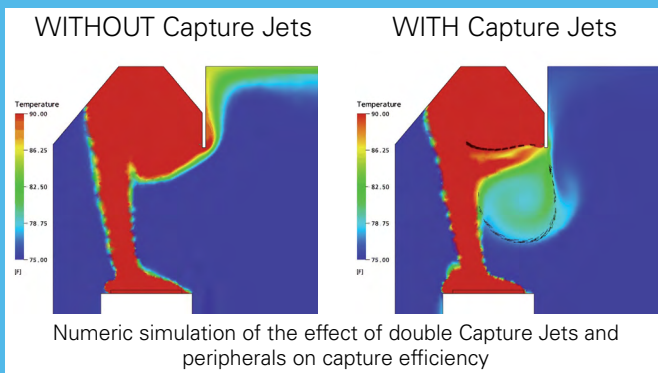
Providing the building blocks for the highest level of energy efficiency in the commercial kitchen ventilation.



**Start with the most efficient exhaust system, Capture Jet™ technology:**

**Essential control of capture and containment**

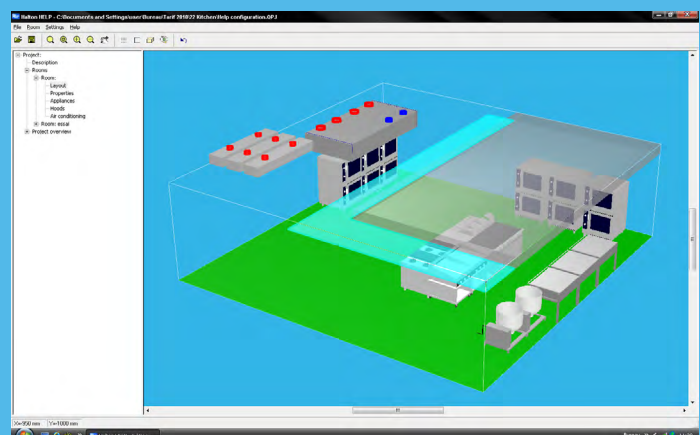
M.A.R.V.E.L. does not directly affect the maximum flow rate. Only the hood's own efficiency and rigorous Heat Load Based Design method enables reliable determination of maximum exhaust flow rates. That's where Capture Jet™ technology comes in.



- Capture Jet™ technology allows for reduction of upwards of 65% when compared with constant volume exhaust only systems
  - Comparison is based on documented ASTM 1704 testing for like sized hood systems 24" high.
- 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 during variable volume operation to achieve a total reduction of 65%. The two technologies create an optimized and integrated system.

HELP (Haltan Energy Layout Program) software calculates exhaust flow rates according to the type of cooking equipment, its input 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. No rules of thumb, an actual load calculation.

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).





# What A.S.H.R.A.E. Requires for Compliance with 90.1-2016

Compliance with A.S.H.R.A.E. standard 90.1 is the first step in becoming L.E.E.D. certified.

- A.S.H.R.A.E. 90.1 promotes efficient kitchen hoods and energy efficiency without penalizing indoor environment
- Requires at least 1 energy conservation measure for kitchens that exhaust more than 5000 cfm.
  - Maximum use of transfer air
  - Use of Heat recovery on the exhaust system
  - Use of Demand Control Kitchen Ventilation (DCKV)
- Reduce exhaust requirements from the norm by 30% or more (e.g. norm by ASHRAE 154 Standard)

Requirements of DCKV Systems to meet ASHRAE 90.1-2010

- Demand Ventilation system(s) on at least 75% of the exhaust air.
- Systems must be capable **of at least 50% reduction** in exhaust and replacement airflow while maintaining full capture and containment of smoke, effluent and combustion products during cooking and idle conditions.
- Performance Testing: An approved field test method shall be used to evaluate design air flow rates and demonstrate proper capture and containment of installed commercial kitchen exhaust systems. Where demand ventilation systems are utilized to meet 6.5.7.2.3.
- Additional performance testing shall be required to demonstrate proper capture and containment at minimum airflow.





Seamless Integration; M.A.R.V.E.L. and Capture Jet™ technology:

**Fastest response time of any DCKV system, identifying changes in appliance status instantaneously!**

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

Thanks to the Thermal Imaging Sensor (LIR) technology, M.A.R.V.E.L. continuously measures the actual status of each item of kitchen equipment. The LIR sensor is used in conjunction with the M.A.R.V.E.L. space and duct temperature sensor.

- A unique algorithm compares sensor input to determine exhaust levels (off, idle, graduated, cooking)
- Thermal Imaging Sensors (LIR) measures appliance temperature, up or down and the rate at which it changes. Quick temperature drop is an indicator of cooking activity (frozen fries into hot oil ex.)
- Monitoring of space temperature ensures heat is not spilled during variable volume operation.

On the basis of the status, and when equipped with U.L. listed Automatic Balancing Dampers (ABD) integrated into the exhaust hood, M.A.R.V.E.L. adjusts the exhaust and supply air flow rates automatically, and independently for each hood based on appliances status or zone by zone (even if all hoods are connected to a single fan).



Room Temperature  
Sensor



ABD - Automated  
Balancing Damper



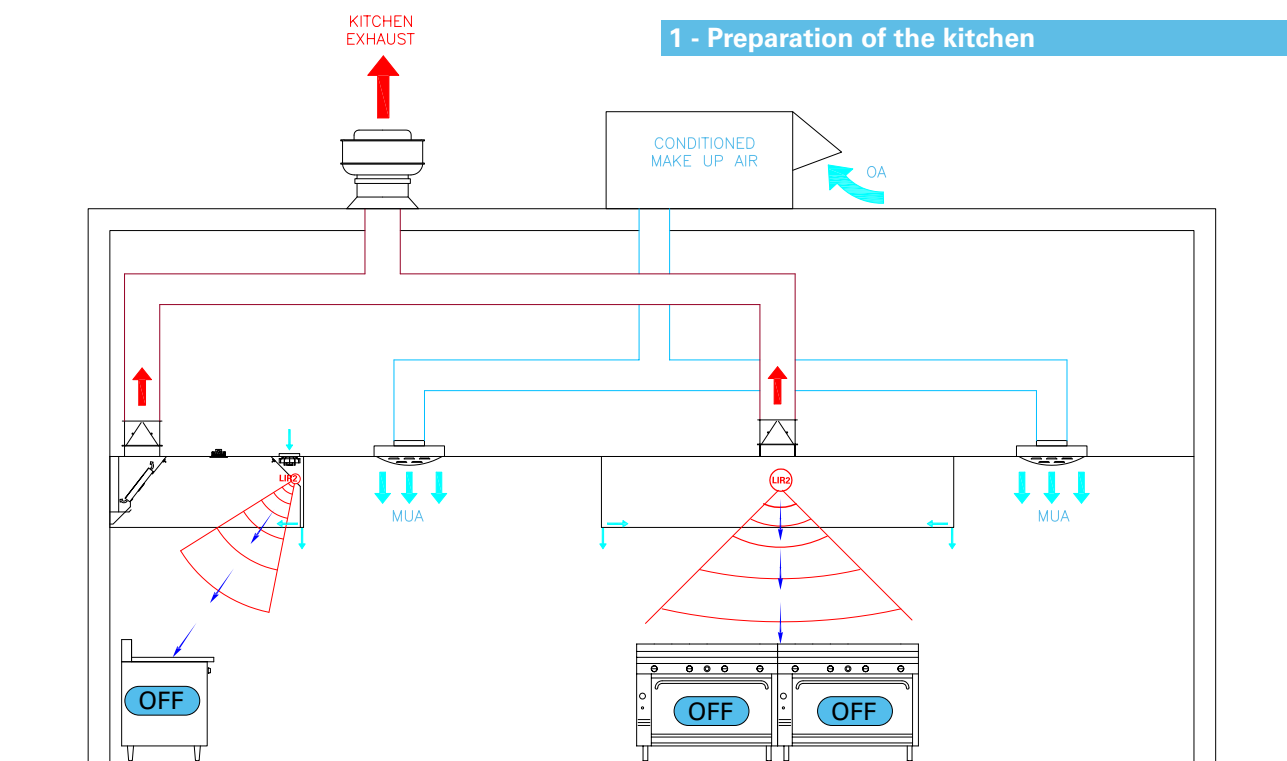
LIR2 - Thermal Imaging  
Sensor



Pressure Transducer



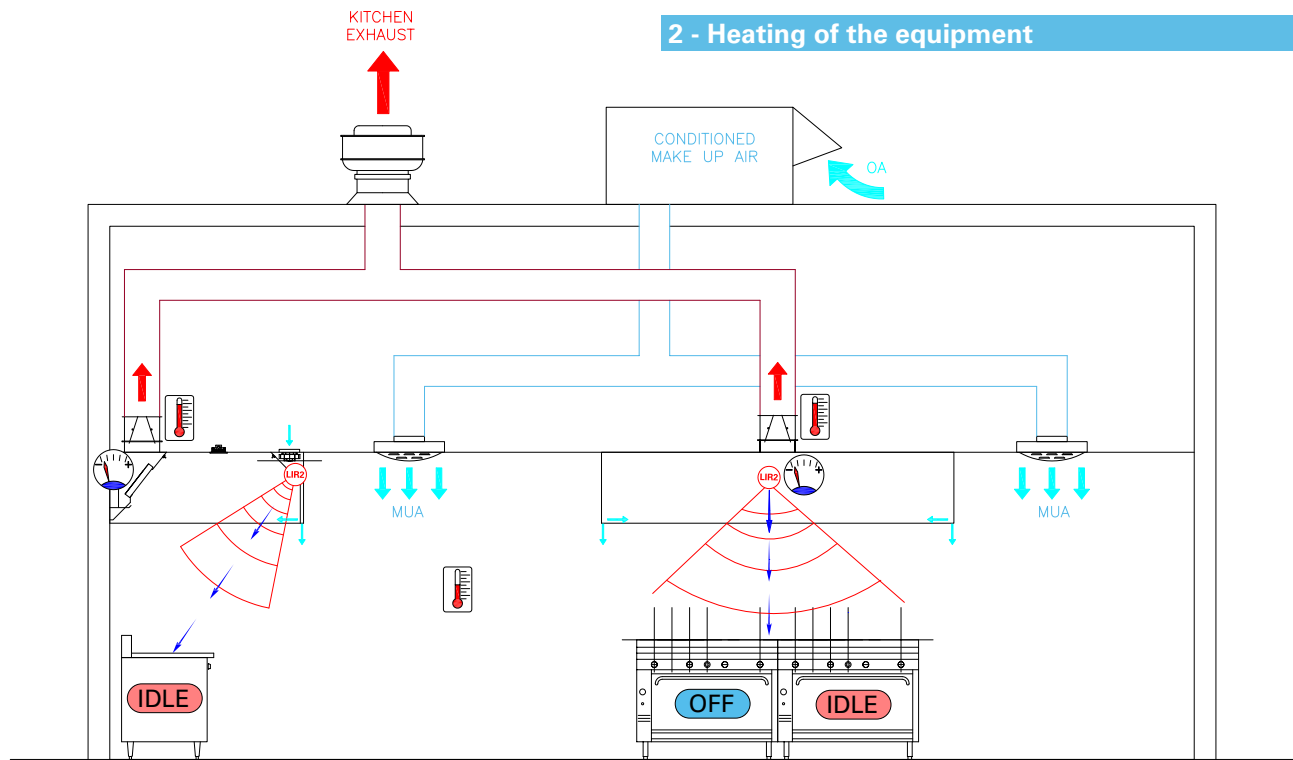
## M.A.R.V.E.L. A Basic Configuration Overview



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 allow flow rate that keeps proper ventilation or space balance maintained during the inactivity. In the latter case, the fans and dampers are automatically adjusted to the minimum programmed settings.

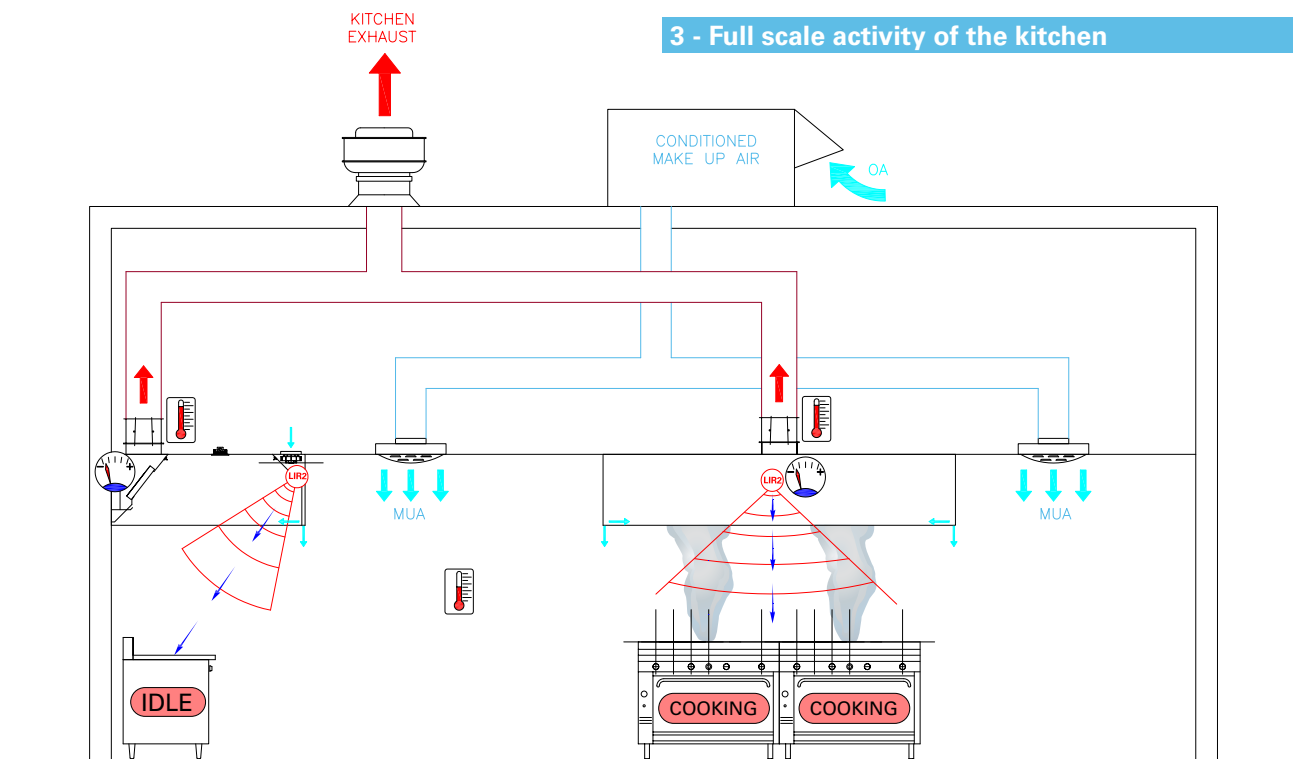


## 2 - Heating of the equipment



The cooking equipment is gradually heated according to the requirements of the menus to be prepared. The LIR2 Thermal Imaging 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 LIR2 Thermal Imaging Sensor 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. System Offering, Providing the Highest Degree of Design Flexibility Available!

## M.A.R.V.E.L. I

### (DCKV - Demand Control Kitchen Ventilation)

Ideal with single fan and single hood application

- Continuous measurement and reporting exhaust airflow for each hood.
- Automatic balancing to design airflows at system commissioning stage.
- Web connectivity.
- Ability to remotely monitor and troubleshoot.
- Ability to communicate with upper level Building Management Systems.
- Fully expandable to Halton's F.O.R.M. (Facility Optimization & Resource Management).



## M.A.R.V.E.L. II

### (DCKV with Balancing Dampers)

Same control sequence and functionality as M.A.R.V.E.L. I

- Used with multiple hoods on a single fan/duct configuration.
- Uses automated balancing dampers to individually control airflow for each hood section.

## M.A.R.V.E.L. + (M.A.R.V.E.L. Plus)

### (DCKV with Exhaust & Supply Modulation with Zone Control)

Same control sequence and functionality as M.A.R.V.E.L. I & M.A.R.V.E.L. II

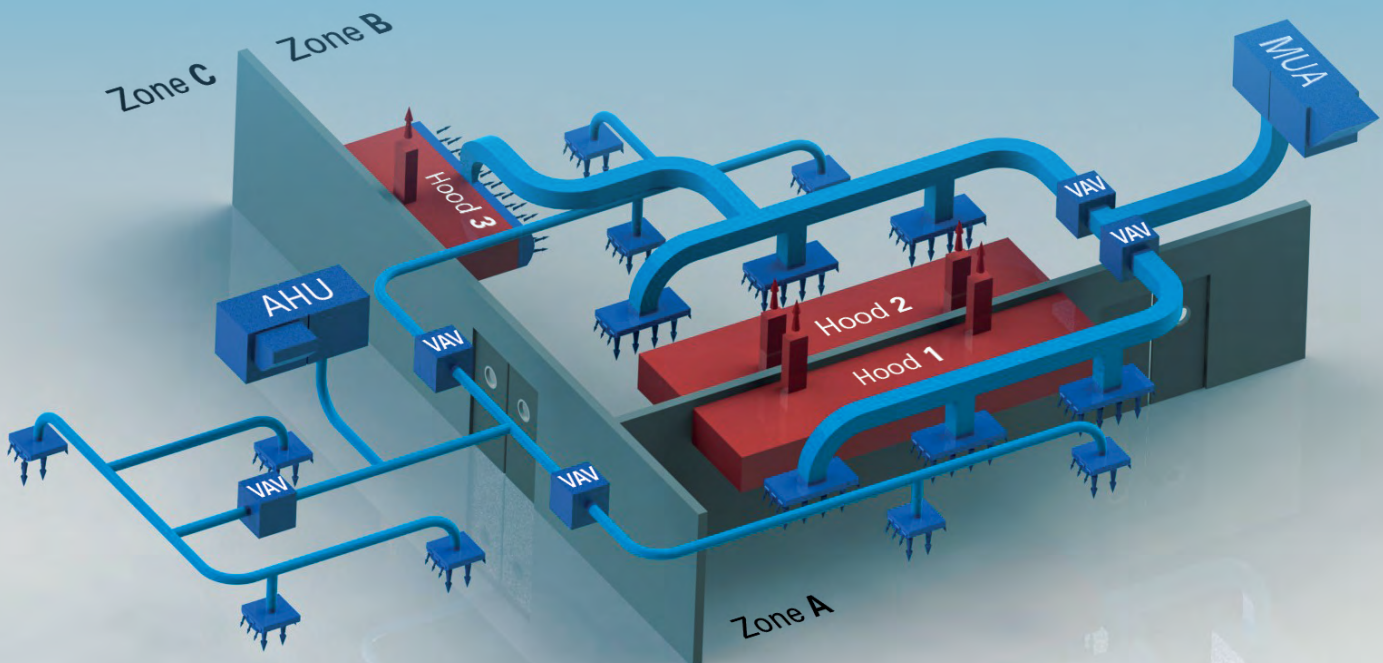
- Provides Supply Air Zone Control with VAV terminal units and KCD Kitchen Supply Diffusers.
- Continually maintains space balance during variable exhaust volume.
- Non Disruptive Air Distribution specifically designed for the kitchen space.

# M.A.R.V.E.L., Addressing Space Balance, Building H.V.A.C. Integration and Communication with upper level Building Management Systems

With Demand Control becoming the norm rather than the exception, managing the changes in exhaust volumes and building pressure has been a challenge. The M.A.R.V.E.L. system directly measures exhaust rates in each hood in real time. This capability allows for an accurate signal for incoming replacement air ensuring space balance as the system varies the exhaust during operation. It also enables M.A.R.V.E.L.'s unique feature that greatly simplifies commissioning of a complex ventilation system. With a press of a button M.A.R.V.E.L. automatically balances supply and exhaust to design airflow, making sure each hood operates at design airflow and replacement air is properly balanced for each zone.

As the majority of capture and containment problems occur due to high velocity discharge from replacement air diffusers, the next logical step was to design and supply a diffuser for commercial kitchen use that maximizes air flow rates while minimizing thermal plume disruptions. No longer will designers have to rely on office building type diffusers, but can select from a series of high volume, low velocity diffusers that are appropriate for general supply and remote zones in kitchens.

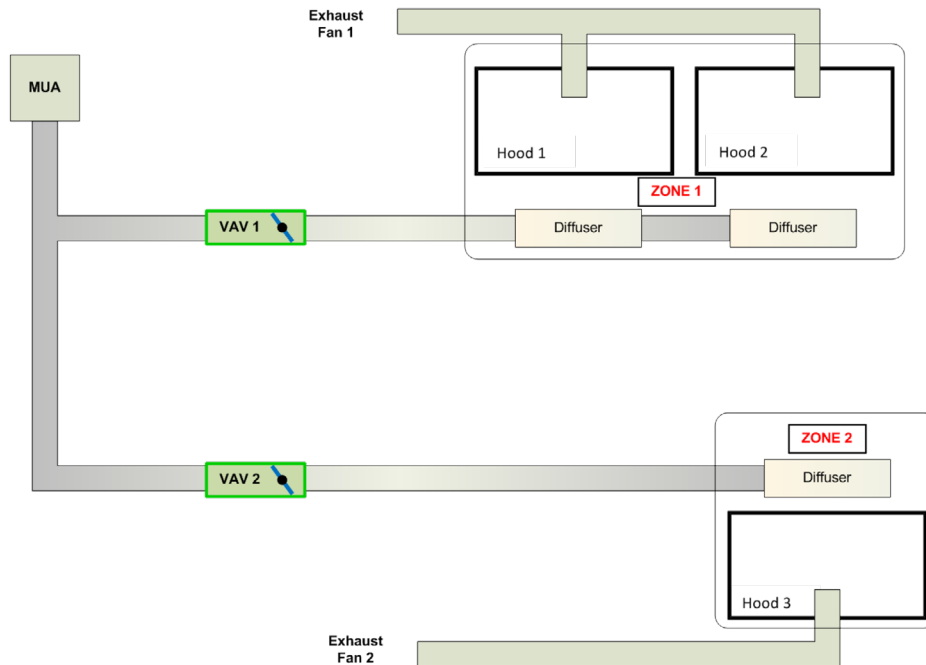
- The system is self-balancing and automatically adjusts exhaust air volumes and the appropriate makeup air requirement
  - M.A.R.V.E.L. can be designed to create individual supply air zones and deliver it in a way that does not interfere with the cooking operation.
  - For the first time ever the design team can provide a complete exhaust and air distribution system that is synchronized and encompasses all the design criteria needed to excel in the commercial kitchen setting.
  - Ability to output all monitored points and alarms to upper level B.M.S. systems, BacNet, Modbus, Lonworks compatible.



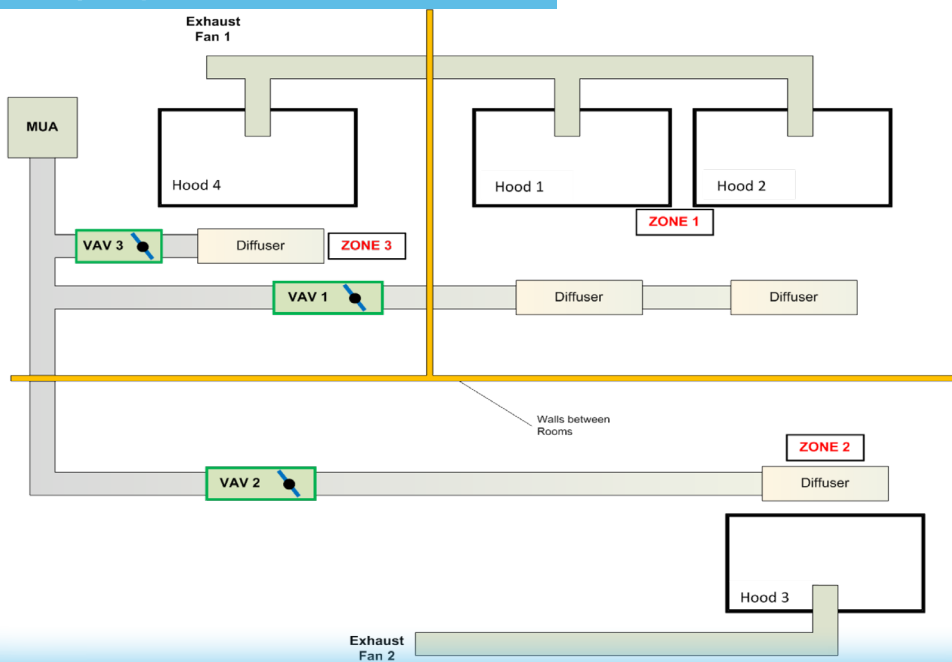


# Delivery of Replacement Air When it's Needed and Where It's Needed!

## Simple Zoning by Exhaust Fan Group.



## Zoning example by room

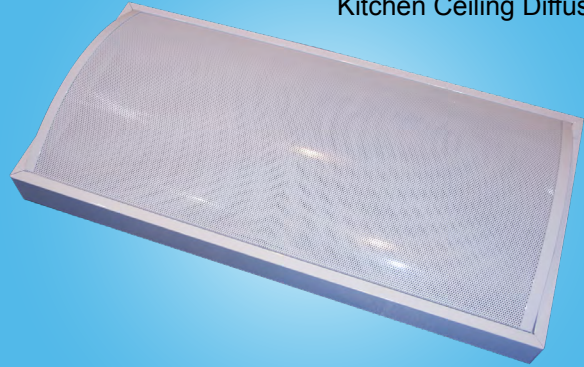


These are just 2 examples of supply air zoning. M.A.R.V.E.L. is as flexible as there are unique supply air delivery requirements.

## What Else is Required for M.A.R.V.E.L.+?

### **KCD**

Kitchen Ceiling Diffuser



The Halton model KCD Kitchen Ceiling Diffuser provides for high volume, low velocity discharge of supply air without disrupting hood performance. Tested performance of supply air discharge ensures the proper application and desired results of even air distribution in proximity to the hood. Part of the M.A.R.V.E.L.+ system, the KCD diffuser is key component of the total solution for commercial kitchen ventilation.

### **KVV-R & KVV-S VAV Terminal Unit** Variable Air Volume



Energy efficient variable air volume system. Used in conjunction with M.A.R.V.E.L.+ Self Balancing Kitchen system, this sensor measures four quadrant centre average airflow. This ensures accurate zone control. M.A.R.V.E.L.+ provides the appropriate supply air signal by measuring exhaust airflow from each hood. The proper amount of supply air is determined during variable volume operation and each zone is ensured of the appropriate volume of air as determined by the cooking activity

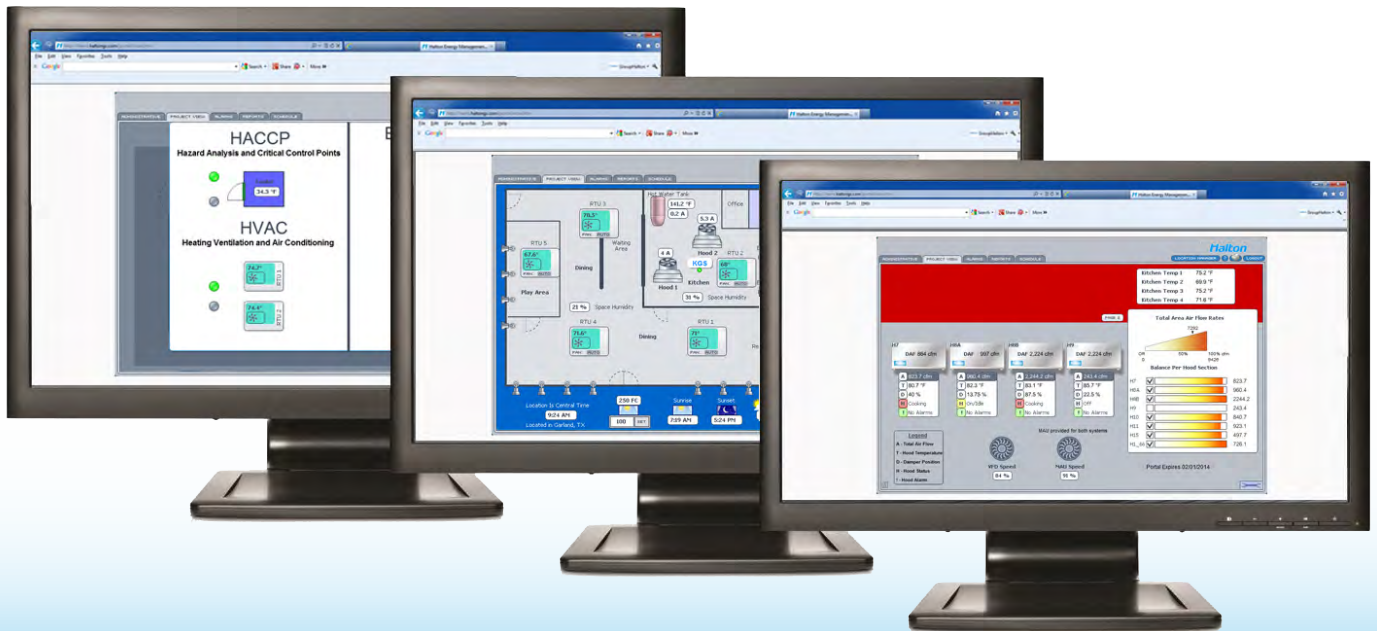




## Advantages and features of M.A.R.V.E.L.:



- 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 replacement air in kitchens.
- 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 the heat signature from the appliances dissipates. The system supports minimum permanent ventilation settings. It has a manual, programmed on schedule and automatic on/off function.
- The system provides extensive data reporting and connectivity capabilities.
- Fire safety functions enable extraction to be switched to maximum flow and replacement air 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.



## Expanding M.A.R.V.E.L. Demand Control Ventilation into a Facilities Optimization and Resource Management (F.O.R.M.) system is limited only by your imagination!

Halton's F.O.R.M. (Facility Optimization and Resource Management) system controls the lighting and equipment within your facility reducing gas, water and electricity consumption while improving operational efficiency. A system quietly increasing profitability and sustainability.

### Features

- Optimize HVAC, refrigeration, lighting and utility consumption.
- Manage multiple sites, schedules and systems.
- Unlimited algorithms customized for optimal performance.
- Troubleshoot malfunctions and minimize nuisance calls.
- Real-time access, monitoring, and data logging through a Web-based system.
- 24/7 with automatic alarm – live support available as requested.
- UserInterface training for executives, managers and staff.

### The benefits are many:

- Up to 30% on annual utility savings.
- Predictive equipment maintenance based on need, not schedule
- Reduced equipment repairs and downtime; increased equipment life.
- Decreased carbon emissions and fulfillment of corporate social responsibility
- And more...





Photo provided by Jake's Point of View



# ABOUT US

Halton Group is the global technology leader in indoor air solutions for demanding spaces. The company develops and provides solutions for commercial and public premises, healthcare institutions and laboratories, professional kitchens and restaurants as well as energy production environments and marine vessels. Halton's mission is to provide its end-users with safe, comfortable and productive indoor environments that are energy-efficient and comply with sustainable principles.

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