

# HEATBASE Ltd FACTSHEET 14

## Problems with Condensing Boilers, Flues and plumes.

There are many problems and complaints with modern condensing boilers regarding their flue systems; especially the nuisance factor regarding the dispersal of condensate plumes; even when they have been installed in a manner better than the regulations and manufacturers state. They can, and do linger around the owners' property as well as being blown into neighbours gardens and patio areas.

Standard efficiency boilers have a flue gas temperature that at its maximum should be 260 degrees C, but under normal circumstances it will average between 180 and 200 degrees C as it leaves the flue terminal. Since heat rises, and the gases are much lighter and hotter than external ambient temperatures; waste flue gases easily disperse and cause very few problems when installed correctly. Even during adverse weather conditions, problems are minimal due to the higher temperature of the gases.

High efficiency condensing boilers are another matter. They usually have a maximum flue gas temperature of 100 degrees C and are usually much lower; often between 50 and 70 degrees C. Even during periods of good weather this can cause problems as the gases are so "cool" and much heavier due to the amount of moisture they contain, that the "plume" can hang around the flue terminal which can then lead to problems as the waste exhaust gases are drawn back into the burners own air supply; this is commonly known as vitiation. This can lead to problems with dirty photocells, damage to nozzle tips which can then lead to complete or intermittent boiler breakdowns. As well as the burner suffering from intermittent lockouts due to erratic combustion, if waste gases are drawn back into the burners own air supply it can also cause problems with metal fatigue and/or distortion of baffles inside the boilers heat exchanger. During colder weather the problem can be even worse as the gases rapidly cool upon leaving the flue terminal, making them even cooler and heavier than before. Add a foggy day, snow or heavy or drizzling rain and it becomes worse again!

Plume management kits can be purchased from most boiler manufacturers which **may** help alleviated the problems of vitiation and in some cases help with the nuisance factor of the plume. The main benefit is that it increases the distance between the termination of the flue gases and the point at which air for combustion enters and therefore reduces the chance of vitiation.

Conventional or vertical discharge flues used to help with the dispersal of products of combustion but can now cause more problems with modern condensing boilers; as the gases are cooling even further during the additional distance they need to travel before exiting the flue terminal, they become even cooler and more saturated with moisture, which further reduces the buoyancy of the plume.

Condensate discharge pipes should incorporate a trap and not contain copper or mild steel and should be run internally whenever possible to try to prevent freezing. Any external pipework or pipework in an unheated space such as a garage, should be either 22mm and be lagged or be run in 35mm pipe. Any run should have adequate fall and whenever possible not exceed 3 metres; otherwise the pipe size should be increased to 42mm pipe. If the condensate terminates into an external drain it must be below the grate and if a soak away is used it must be a minimum of 500mm from the building and be filled with lime stone chippings to neutralise acidic condensate.

Unlike Gas boilers, Oil boilers have no failsafe mechanism to shut it down in the event of a frozen condensate pipe. This means that an increased amount of condensate can build up in the boiler which can cause several problems. Additional condensate plume has to try to exit through the flue system which can lead to combustion difficulties and intermittent breakdowns. Eventually sufficient condensate may start to leak through the boiler seals which can cause corrosion of access bolts and other items. In some cases if sufficient condensate builds up it may back up or drip into the primary heat exchanger where the moisture will boil and turn to steam due to the higher temperatures; steam has a much larger volume than normal flue gases or condensate so if this happens the boilers flue and flue ways cannot cope with the increased volume of gases and it will lead to increased combustion chamber pressures, gases forcing their way through seals as well as combustion issues, breakdowns and damage due to acidic moisture backing into the mild steel primary heat exchanger.