

CLAIMS

1. A flammable gas diluter for diluting a flow of flammable gas to a concentration below the flammability limit of said flammable gas, said diluter comprising:
- 5 a dilution vessel comprising an outer envelope defining a longitudinal flow passage from an inlet to an outlet;
- at least one air inlet assembly for directing a flow of air into said inlet of said dilution vessel;
- 10 a flammable gas inlet arrangement located towards an inlet end of said dilution vessel;
- two gas flow generators configured to pump a flow of air into said air inlet assembly, said two gas flow generators being located upstream of said flammable gas inlet arrangement; wherein
- 15 said two gas flow generators are configured to operate as operational and backup gas flow generators, and
- two dampers, one damper associated with each of said gas flow generators, each of said dampers being mounted between said corresponding gas flow generator and said dilution vessel, said dampers being configured to
- 20 obscure a passage between said corresponding gas flow generator and said dilution vessel when closed and to open said passage between said gas flow generator and said dilution vessel when open; and
- control circuitry configured to control the opening and closing of said dampers, said control circuitry being configured to open said damper during an
- 25 operational mode of said corresponding gas flow generator and to close said damper when said corresponding gas flow generator is stopped in standby mode.
2. A flammable gas diluter according to claim 1, said control circuitry being configured in response to a signal indicating that a currently operational gas flow
- 30 generator is to be stopped and a gas flow generator currently in standby mode is to be started to:

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control said gas flow generator in standby mode to start and after a predetermined delay to:

control said damper associated with said started gas flow generator to open.

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3. A flammable gas diluter according to claim 2, wherein said predetermined delay comprises a time for said gas flow generator in standby mode to attain a rotational speed of at least 70% of a normal operational speed.

10 4. A flammable gas diluter according to claim 2 or 3, said control circuitry being configured to control said damper associated with said gas flow generator to be stopped to close after said predetermined delay and to control said gas flow generator to stop.

15 5. A flammable gas diluter according to any one preceding claim, said control circuitry being configured in response to a signal indicating said diluter is to startup to:

control said damper associated with said backup gas flow generator to be open and said damper associated with said operational gas flow generator to be closed and to control said backup gas flow generator to start; and

20 after a set test time to control said operational gas flow generator to start; and

after a predetermined delay to control said damper associated with said operational gas flow generator to open and said damper associated with said backup gas flow generator to close; and

25 to control said backup gas flow generator to stop operating.

6. A vacuum pumping system for evacuating at least one vacuum chamber in a semiconductor processing tool, said vacuum pumping system comprising:

30 a plurality of vacuum pumps for evacuating said at least one vacuum chamber; and

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an abatement system for receiving an exhaust from at least one of said at least one vacuum chamber, wherein said abatement system comprises a flammable gas diluter according to any preceding claim.

- 5 7. A vacuum pumping system according to claim 6, wherein said semiconductor processing tool comprises an extreme ultraviolet lithography tool and said flammable gas comprises hydrogen.
8. A vacuum pumping system according to claim 6 or 7, further comprising a  
10 housing for housing said plurality of pumps; and  
an air flow duct for receiving air from said housing;  
said air flow duct being in fluid communication with said at least one air inlet assembly for supplying said air to said flammable gas diluter, such that air flows through said housing, along said air duct and into said diluter in response to  
15 operation of at least one of said gas flow generators.
9. A method of controlling the operation of two gas flow generators for supplying a gas flow to a flammable gas diluter according to any preceding claim, said method comprising  
20 controlling a first one of said two gas flow generators currently in standby mode to start, while keeping said damper between said first gas flow generator and said dilution vessel in a closed position;  
after a predetermined delay:  
controlling said damper associated with said first gas flow generator to  
25 open.
10. A method according to claim 9, said method further comprising: controlling said damper associated with said second gas flow generator to be stopped to close after said predetermined delay; and  
30 controlling said second gas flow generator to stop.

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11. A method according to any claim 9 or 10, said method comprising in response to a signal indicating said diluter is to startup:

controlling said damper associated with said backup gas flow generator to be open and said damper associated with said operational gas flow generator to be closed;

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controlling said backup gas flow generator to start; and

after a set test time controlling said operational gas flow generator to start;

and

after a predetermined delay controlling said damper associated with said operational gas flow generator to open;

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controlling said damper associated with said backup gas flow generator to close; and

controlling said backup gas flow generator to stop operating.

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