SUMMARY

Foam material is introduced at the gas-path entry of turbine equipment while off-line. The foam will coat and contact the internal surfaces, scrubbing, removing, and carrying fouling material away from equipment.

In an aspect, the present disclosure refers to a method for scheduling a foam cleaning of a gas turbine engine, comprising:

quantifying a range of improvement of an operational parameter within a family of gas turbine engines achievable by foam cleaning of a specific member of the family;

operating a specific engine of the family;

measuring the operational parameter of the specific engine during said operating;

determining that the specific engine should be foam cleaned;

scheduling a foam cleaning of the specific engine;

streaming foam into the specific engine after said scheduling; and

rotating the specific engine during said streaming.

In an aspect, the present disclosure refers to a method for providing a foamed liquid cleaning agent to a gas turbine engine, comprising:

operating a gas turbine engine;

measuring an operational parameter of the gas turbine engine during said operating;

determining that the gas turbine engine should be foam washed based on the measured operational parameter;

operating a source of a liquid cleaning agent, a liquid pump, and a source of pressurized gas;

mixing pressurized gas with pressurized liquid cleaning agent and creating a supply of foam; and

streaming the supply of foam into the gas turbine engine through a non-atomizing nozzle.

One example of the present disclosure pertains to an apparatus for foaming a cleaning agent. Some examples include a housing defining an internal flowpath having first, second, and third flow portions, a gas inlet, a liquid inlet for the cleaning agent, and a foam outlet. The first flow portion includes a gas plenum that is adapted and configured for receiving gas under pressure from the gas inlet and including a plurality of apertures, the plenum and the interior of the housing forming a mixing region that provides a first foam of the liquid and the gas. The second flow portion receives the first foam and flows the first foam past a foam growth matrix adapted and configured to provide surface area for attachment and merging of the cells. The third flow portion flows the second foam through a foam structuring member downstream of either the first portion or the second portion adapted and configured to reduce the size of at least some of the cells. It is understood that yet other examples of the present disclosure contemplate a housing having only a first portion; or a first and second portion; or only a first and third portion in various other nucleation devices.

Another example of the present disclosure pertains to a method for foaming a liquid cleaning agent. Some examples include mixing the liquid cleaning agent and a pressurized gas to form a first foam. Other examples include flowing the first foam over a member or matrix and increasing the size of the cells of the first foam to form a second foam. Yet other examples include flowing the second foam through a