SS Great Britain

Brunel's 1843 SS Great Britain was the world's first iron ship and the first to be driven with a screw propeller. Following a long and impactful career, the abandoned ship was salvaged and returned to the original Bristol dry dock in which it was constructed, creating a site of international cultural significance. The most vulnerable parts of the Victorian wrought iron are below the waterline, where the salt concentration is highest causing aggressive chloride-accelerated corrosion. To conserve the ship, a glass 'sea' has been constructed at waterline level in the dry dock, and the air adjacent to the surface of the hull is kept at an average of 20% relative humidity. The dry dock is grade ii* listed and is a porous structure; it was not possible to prevent water ingress through the dock walls. The SS Great Britain Trust are aiming to reduce energy consumption and associated CO2 emissions and are interested in assessing whether the air delivery system in the dry dock could be improved, to deliver air more efficiently only to the areas it is most needed, minimising the amount of moisture evaporation from wetter areas of the dock walls and floor. A number of proposals have been put forward for possible improvements, including changing the diffuser shapes, a secondary ambient air curtain, a retractable partition to be deployed out-of-hours, or a flow driven by buoyancy rather than momentum.

Questions that could be investigated

1. What's the optimal angle for current diffusers in relationship to the shape of the ship's hull?
2. Would a different velocity from current system improve the air curtain effect on the hull?
3. What's the optimal distance between diffusers based on the existing system configuration/diffuser size/flowrates?
4. What's the optimal diffuser shape, size, and distribution for a bottom-up air curtain?
5. Would an additional ambient air top-down air curtain reduce the moisture ingress from dry dock walls?

Available data

CAD and CFD models, and various sensor data from the space are available.