Energy and exergy analysis of a cruise ship

**Remarks**

*Methods*

* Variation of the heat demand during the day [R1]

Assumed constant in the initial paper, with a reference to the Ph.D. thesis of Marty

For the **top-down** analysis, I plan to use a heuristic version of the daily consumption, based on considering the cruise ship as if it was a hotel. I have already published a paper with this assumption valid, so we should be able to use it as a reference

* Calculation of the physical energy [R1/TV]

Defined as the relative enthalpy, in relation to the ambient temperature and pressure – reference? (Kotas?)

I don’t really know any good reference. However, as enthalpy is defined as enthalpy difference, one should always define a reference state.

* Energy analysis – is the chemical energy accounted on a LHV or HHV basis?

Energy analysis -> LHV (as for standard practice).

Exergy analysis -> HHV (again, as for standard practice)

* Nomenclature consistency with literature (Ex(.) uncommon, rather E(.)) and definitions of the fuel, product, input, output and efficiency concepts in the paper missing (may be unclear for people not familiar with the standards of Tsatsaronis) + consistency of the wording (e.g. efficiency defect if the ref. is Kotas) [TV]

For the nomenclature, I am open to suggestions. I had done some sort of “revision” for my first exergy analysis paper and ended up selecting “B” for exergy, but I do not really care ☺

* Definition of the environmental conditions (atmospheric pressure and sea temperature), justification for the value is missing, and the impact of yearly variations may be discussed [TV]
* Calculation of the physical and chemical exergies (assumed as HHV for the fuel, but is not defined for the other streams present in the system such as flue gases and water – which is open to interpretation) – the use of the HHV value may result in an overestimation of the exergy destruction in the combustion processes (will likely not change the overall picture though) [TV]

*Results and discussion*

* Presentation of the results of BSFC and heat demand [R1]
* Accounting of the exergy losses and destruction (definition of the control volume is missing, it may be better to present the % based on a sum of losses and destruction, as exergy losses become exergy destruction when broadening the control volume borders to a fraction of the environment) [TV]
* Discussion of the type of exergy that is destroyed (chemical or physical) and split of the % of exergy that is physical or chemical [TV]

How can you define what type of exergy is destroyed?

* Discussion/quantification of the exergy destruction that is really avoidable or unavoidable, especially since the one in the combustion processes can barely be reduced, unless significant system changes [TV]

I see you are going into advanced exergy analysis…the fact is, for doing it properly we would need a real, full model of the system. As far as now, we do not have it, we only have some “data analysis” scripts.

Ideally, what we would do in an unlimited-time scenario, is to create a model of the system, use the measurement to train unknown parameters, and then do the whole analysis based on the model output. Time is a constrained resource, though, and I do not really feel like I have enough of it for doing this.