# Additive vs Substractive Architecture

The Philosophy of the Hyperbody Sudio

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One of the key aspects of the Hyperbody studio at the Faculty of Architecture is the philosophy of optimizing design using computational and parametric tools. Saving material is one of the most important parts of the optimizationg process. Using various instruments we are able to calculate where and how forces flow through the construction of the building and thus we can find out where material is needed. As such we can create buildings with material only there where is needed. Ofcourse this has practical use in the construction of the building – as a building with less material is lighter and hence needs less contructive material. However in this we also take great stepts towards saving our planet, as designing with this philosophy leaves less waste material. This sounds great!

However during my design project of the Msc2 semester I noticed something peculiar. We were designing a drone that would fly around during a symposium, interacting with the audience. A drone, ofcourse, needs to be as light as possible to enhance the battery time and – in our case – make the movements more smooth. For this, we used the classical Hyperbody techniques in order to save as much material as possible. We created CAD files that could be cut by a highly precise lasercutter. The result was a very light frame that the propellers were easily able to lift – however the output of the lasercutter caught me by surprise. While the actual frame was very thin and light, the waste material, that what was left of the plate of plexiglass we put in the machine, was really heavy. This makes sense ofcourse, but it all went in the trash as it was completely useless to us.

The question I then propose is this: are we actually helping the planet by using these techniques, if three quarters of the material ends up in the trash bin? Or are we just being pretentious and use these material saving techniques as keywords to help sell our designs? I have always hated, to the very core of my being, the Seagram Building by Mies van der Rohe. Not because it doesn’t look nice (it is a gorgeous building, actually), but because he used 1500 tons of non-structural bronze in the facade. I think that while most architecture students love this feature of the building, we as Hyperbody students should know better. However, do we? Do we know better? We have a great responsibility towards our planet, do we actually take this responsibility seriously or are we just pretentious?

We at the studio are not unfamiliar to these principles. We use the smart robot arm to carve or cut from large blocks of EPS we can use for various purposes, like molds for concrete. Using these technologies, creating smart or double curved surfaces from concrete is not a problem anymore, but we have to be critical in our thinking as a large amount of material will end up in the trash. The robot arm is in it’s nature not smart enough as it leaves waste by default. That is the mere principle of milling. Even if we take this material and send it back to the company where it could be recycled for new sheets of EPS, the heat and CO2 emissions generated by the recycling process would undo any good will and intentions.

During the GSM3 symposium Jelle Feringa spoke of very clever ways of using robotic production to create beautiful shapes from blocks of marble. Thick wires, layered with diamonds, would cut through the blocks of marble, creating previously unachieved double curves from the dense blocks. However again, the leftover material would be largely useless – and marble is one of the most precious stones on earth. So the question is: is it worth it? Are the elegant design worth throwing away that was is a mere byproduct? During the first day, Marta Malé-Alemany spoke of completely contrasting techniques. Using clever additive techniques she has been able to create architecture with a high degree of freedom of form while also maintaing structural integrity and environmental neutrality.

For my future designs, and the design we are currently working at in the Msc1 studio, I would like to exclusively work with additive techniques as this eliminates any problems regarding waste material. Where molds for double curved facade panels are usually milled and used for constructive materials like concrete, the entire building should, ideally, be created using only additive techniques. 3D printing offers the same freedom of form (even greater), without the drawbacks of waste material ending up in the garbage. While 3D printing techniques are fully capable of being used in constructive elements, they are expensive and are believed not to be quite ready by contractors, like the smart node created by Simone Galjaard of ARUP. That is why instead of investing money, we should invest knowledge to create an image for that public that 3D printing is not the future – it is something of the present. Lightbulbs used to be expensive and not quite profitable, and so were computers and cars – now they are everywhere around us, and we can’t live without them. Ofcourse they are, to this day, still being improved, but we have to start somewhere.

In other words, in my opinion substractive architecture is not the better way; *it is the only way*. Saving material by throwing two thirds of it away makes no sense whatsoever. From the moment we say “oh but is only some EPS”, we have already lost the battle. From that point we have already forgotten the essence of the philosophy of Hyperbody. Because isn’t that what Hyperbody is about? Isn’t Hyperbody about accepting the challenge? Seeing possibilities in what others would perceive to be impossible? We have a responsibility towards our planet and we have to take it seriously. For other architecture students, tackling environmental problems would a means to the end, which is creating architecture. For us, architecture shouldn’t be more than a mere means to helping our planet, the end.