The Philosophy of Pioneers

St. Albans, UK

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Author

Vu-Lam

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Co-Designers

Ishaan
Nayan

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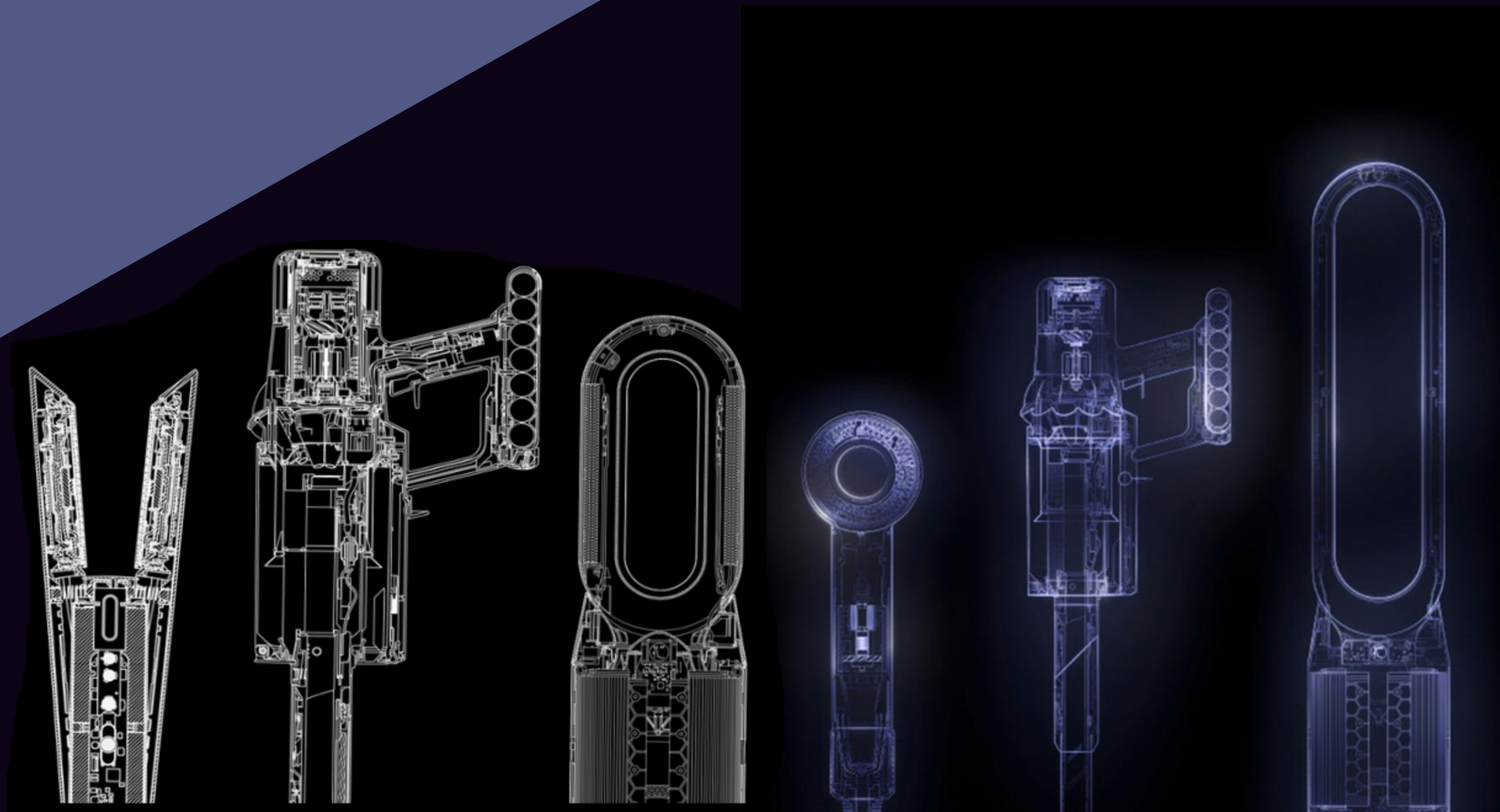
Editors

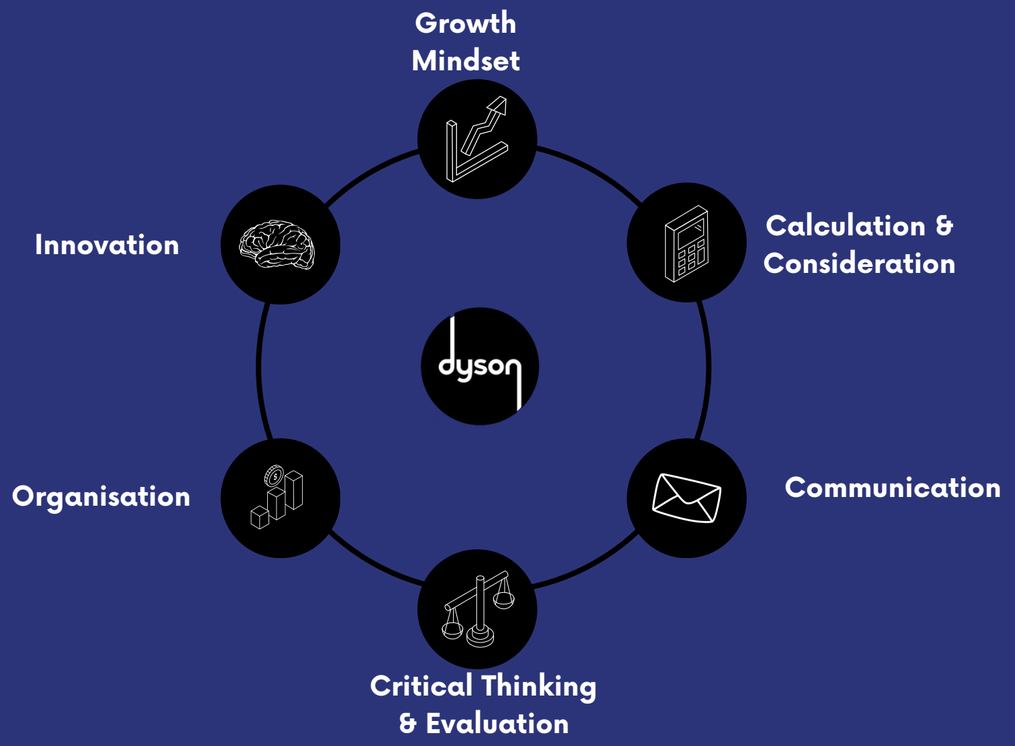
Jeevan
Rishap
Rithik



Why Dyson?

We utilise technology everyday but rarely appreciate the thought process that goes into such an ingenious product.

MODEL TRAITS OF ENGINEERING DEMONSTRATED BY DYSON



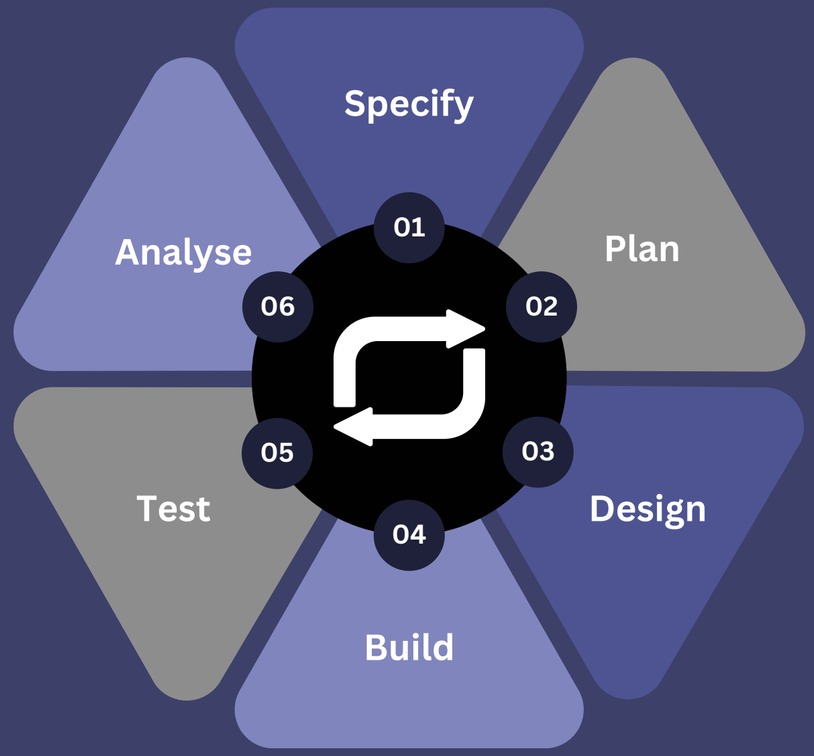
We chose Dyson due to its clear-cut engineering process Dyson resources displays its sketches, CAD and prototypes - key design concepts. Dyson's excellence shows us the importance of VEX as an introduction into STEM and creative careers.

Dyson is a pioneer in household appliances, creating bladeless fans and bagless vacuums, when technology in the household was impractical. As ambitious designers and engineers, we want to replicate this success, starting in VEX.

Our Design Process

We have the same stages as Dyson, including re-iterate, which is one of the most important steps as it allows us to constantly improve. We also complete research (e.g. plastics choice).

Dyson's Design Process



Dyson uses an iterative design process to constantly improve.

Designs are created to solve a brief, a set of problems. Over the next few pages we will explore how Dyson approaches this brief and compare it to our method.

SPECIFICATIONS

Our aims change every iteration.

Specifications (aims) are structured around:

- 7 Musts
- 5 Shoulds
- 3 Coulds

Musts: Requirements for the robot and basic utility (movement).

Shoulds: These optimise the performance of the robot. Generally, they're improvements from the previous iteration.

Coulds: Ideas for competitive advantage, but aren't prioritised at the cost of others.

Dyson's specifications act as a success criteria for a product. It follows the acronym **ACCESS FM**.

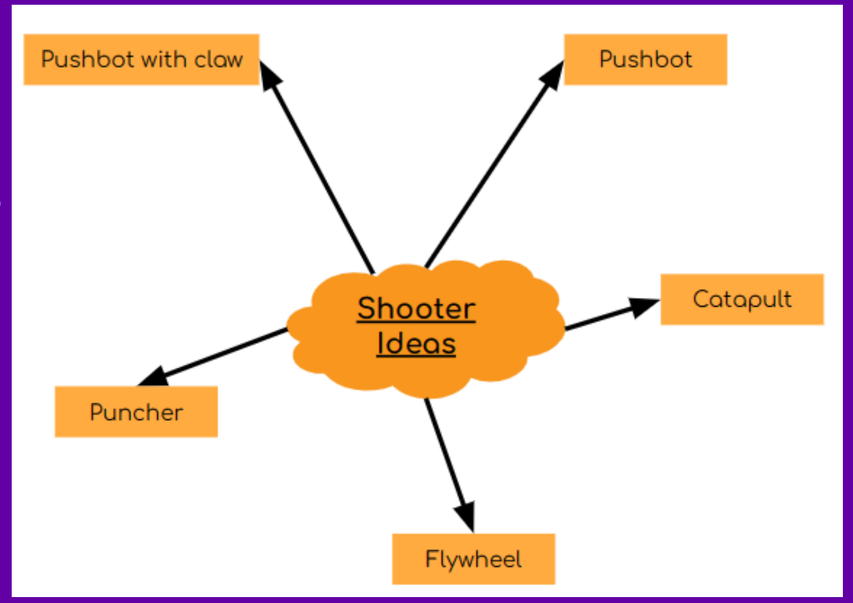
Aesthetics
Cost
Customer
Environment
Safety
Size
Function
Material

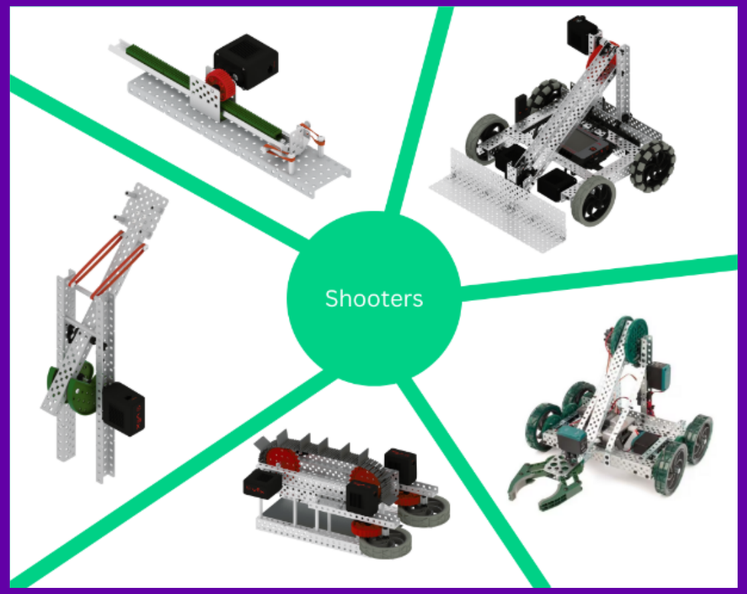
In both design processes, specifications set clear goals for the design.

Dyson needs to think economically, considering costs and aesthetics. In VEX, the concerns are purely based on performance.

BRAINSTORM

Brainstorming often involves a mind-map, and the better ideas are further developed, such as with CAD and visual aids.

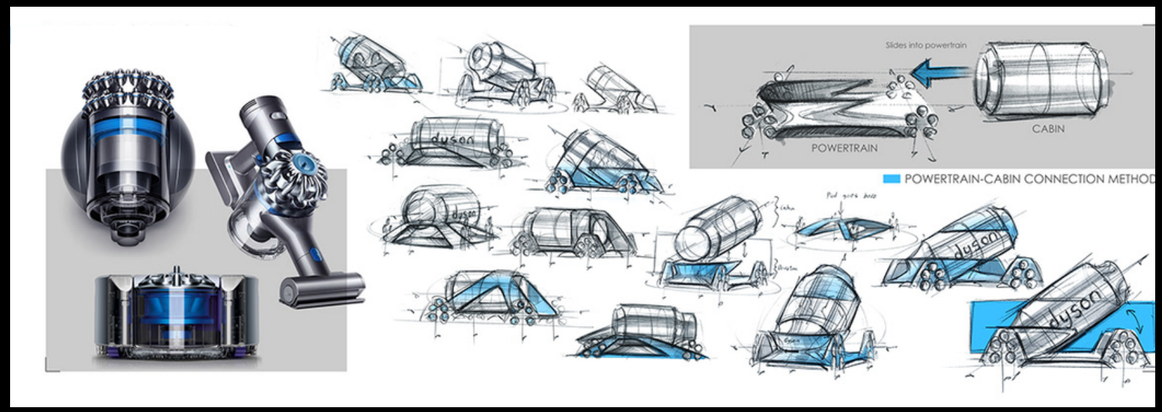




We meet as a team to discuss mechanisms. We evaluate each based on the specifications. We also try to identify flaws, such as counterplay.

Dyson engineers meet to note down every solution they think of, regardless how ridiculous it is, and they display it in sketches. Dates keep track of progress.

James Dyson had to work on 5126 ideas before developing the bagless vacuum.

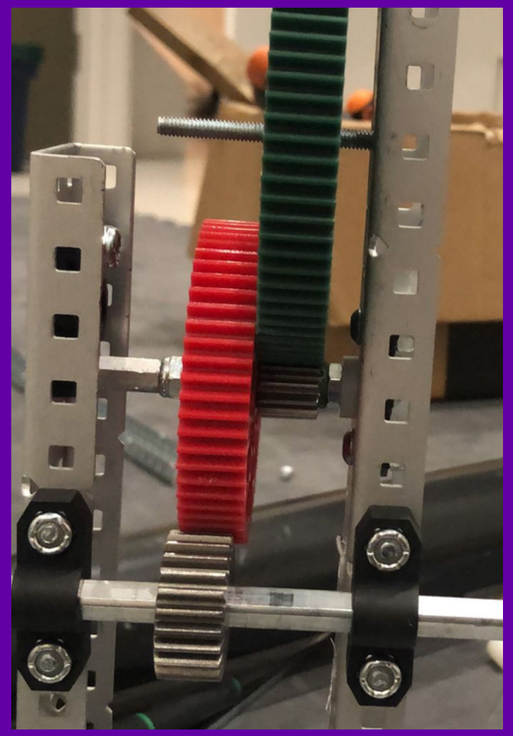


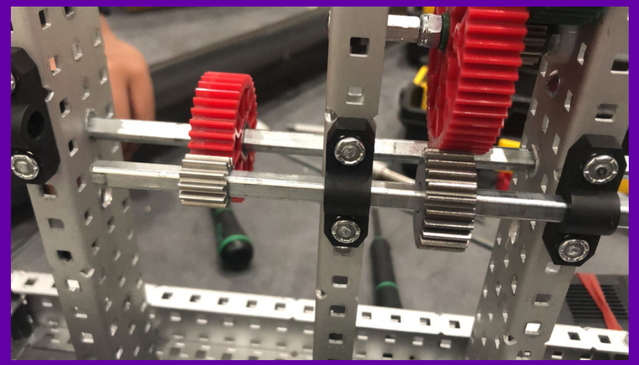
Brainstorming is similar in both design processes. Dyson has more time and resources to explore all ideas, whilst we narrow it down to one idea before developing it.

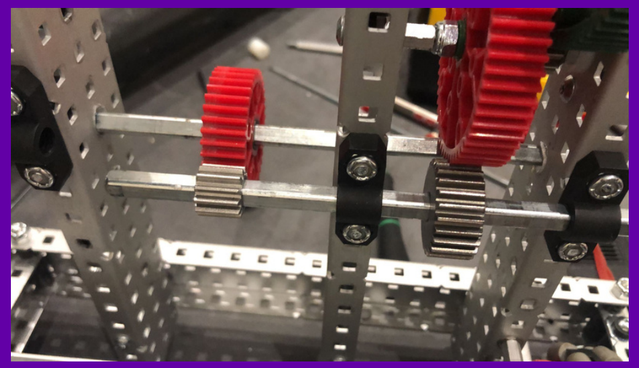
CAD & VISUALISATION

Following evaluation, we choose the most suitable idea to sketch or CAD as single mechanisms, because it is easier to make improvements individually.

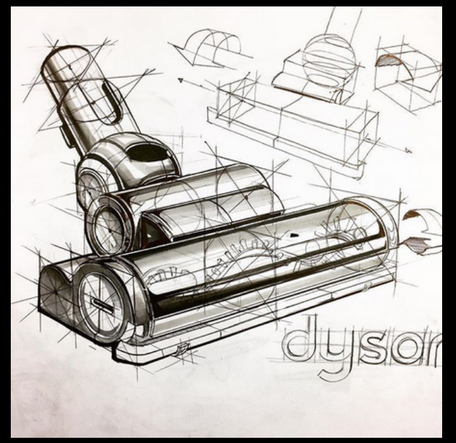
Separate prototypes (below) allow for isolated tests before implementation.

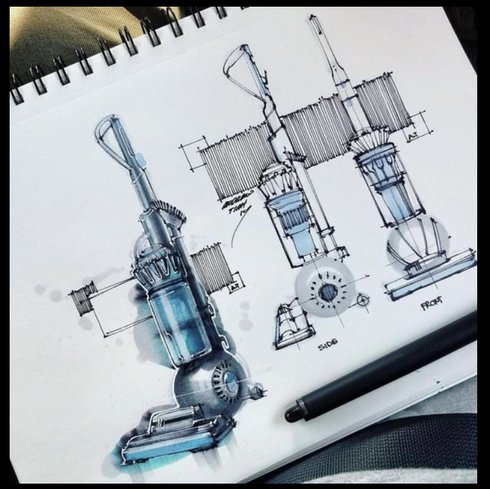






Brainstormed ideas are accompanied by labelled sketches, prototypes (initially cardboard), CAD and 3D-printed products. After assembly, products are re-iterated for improvements, reducing waste and further issues.





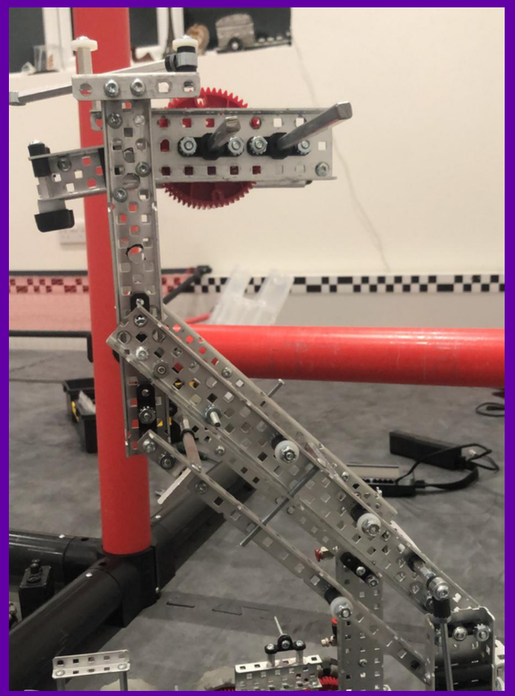
Communication is crucial in both. Prototypes identify problems.

While we prototype one mechanism, Dyson prototypes many thoroughly, due to waste concerns and being larger scale.

TESTING & ANALYSIS

Full robot testing starts with each mechanism individually, before doing driver runs. When an issue is identified, we try to re-create it several times, before finding a cause and a solution.

This is the most repeated phase.



Products undergo rigorous testing using cameras, robots, and motion sensors to evaluate effectiveness and robustness, identify issues, and replicate consumer interactions, allowing for improvements and re-designs.

Fans rotated to breaking point

To attain excellence, all mistakes must be identified in both cases. Dyson is more rigorous as they cannot predict consumer actions.

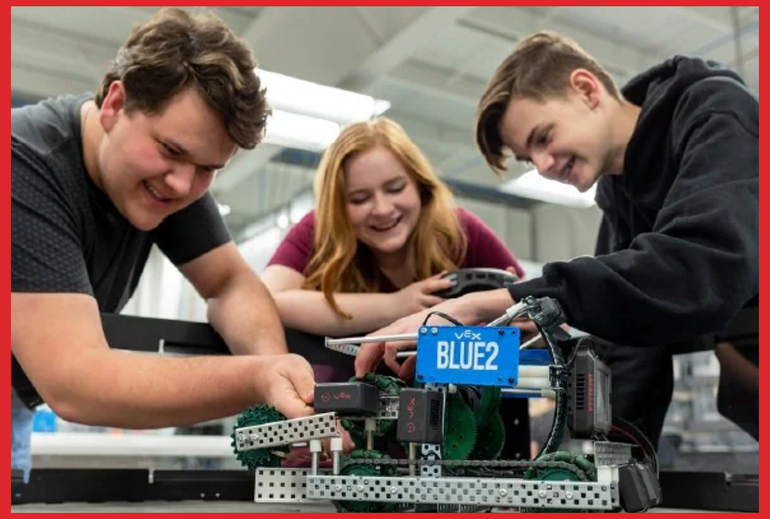
VEX: A Stepping Stone into STEM

Careers require people who are **innovative and resourceful**. VEX teaches us this, encouraging us to find solutions to unconventional problems, as is often the case in the dynamic STEM world. The competition brief provides an issue never seen nor solved before, forcing **creativity**.

Employers look for **adept communication and organisation**. We often work with tight deadlines and pressure. VEX teaches excellence under such conditions.

VEX bridges the gap from education to work, teaching us a **growth and critical mindset**. Our iterative design process reflects this growth, and one of VEX's main pillars is to become comfortable with failure.

Without VEX, the next generation would not be able to become pioneers in STEM.



Bibliography

Research was conducted in 2 stages. We first identified a company to look at, choosing Dyson for its clear iterative design process. Next, we looked at how Dyson creates a product and in-depth explanations of each stage.

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All pictures from Dyson/VEX website, or our own.