Reverse Engineering a Ryobi Air Compressor

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What kind of device did you choose to explore, and why?

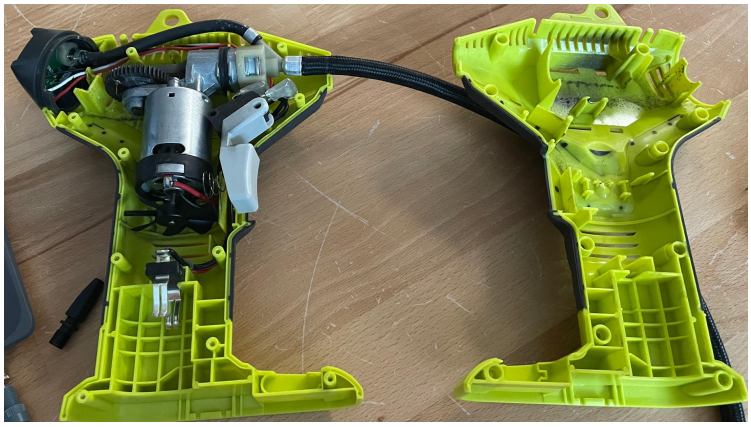
I chose to disassemble a Ryobi Air Compressor because as a program, Brookwood robotics has always used this brand of air pump to fill our pneumatic tanks. When our compressor of 3 years died on us during a competition, I wanted to see what had gone wrong.

Pictured above is the Ryobi Air Compressor before deconstruction

What identifiable parts did you find during deconstruction? - And - What role does each component play in the system?

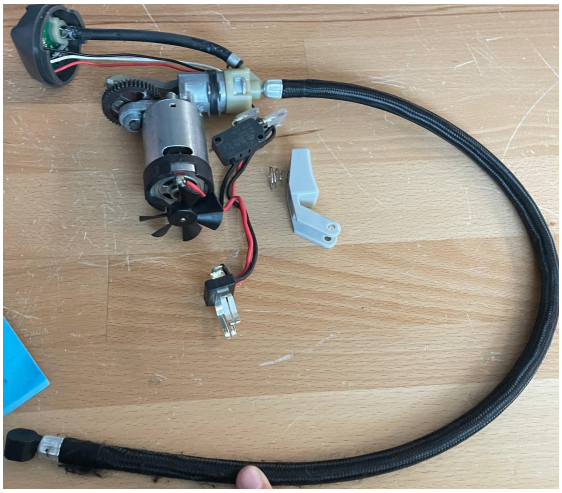
Actual process

1. Unscrewed 2 cm screw from the end of nozzle
    a. This released the
        i. Nozzle pieces
        ii. Lever
        iii. Metal holder
        iv. Rubber inside of the metal holder pieces
2. Took out the Extensions (Different accessories for the nozzle to attach to other things ex. Bike tires or air canisters)
3. Removed the shell of the compressor by removing the screws that held the two pieces together
    a. Unscrewed 9 x 2 cm screws
    b. Unscrewed 1 x 3 cm screw
    c. Pulled the two halves carefully apart so that I wouldn't damage any internal components



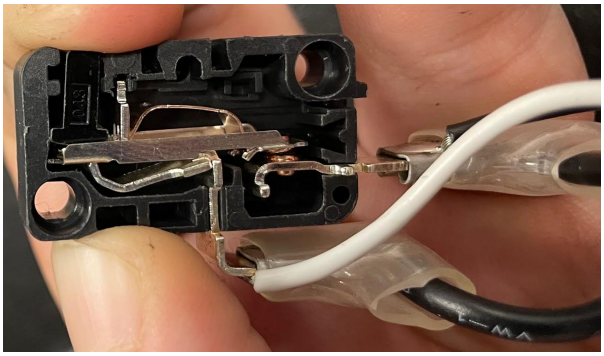
Pictured above is the compressor after separating the two shells. Everything else is intact

4. Removed the battery clip from the bottom of the shell
    a. Pulled out all of the components from the shell
    b. Cut the wires that led to the gauge and the compressor at their bases
    c. Two full red wires are still attached to the Battery clip on the positive side



Pictured above are all of the components after being removed from the shell. Everything is kept assembled to allow for a better analysis of each component

5. Startwin (piece that contains the almost completed circuit) dismantled
    a. Inside consists of metal strips that complete the circuit when the button is pressed



Pictured above is the “Star Twin” mechanism with one side of its shell removed

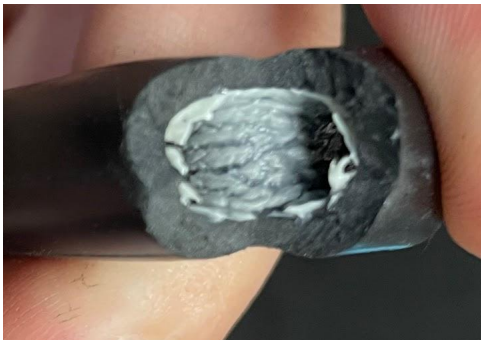
6. Separated the sensor from the compressor by pulling out the air tubing

Pictured above is the connection point between the air tubing, the pressure sensor, and the LCD

7. Cut open the main air tubing
    a. Consists of a woven fabric, a black 2cm tube, and *in theory* an empty space for the air to pass through

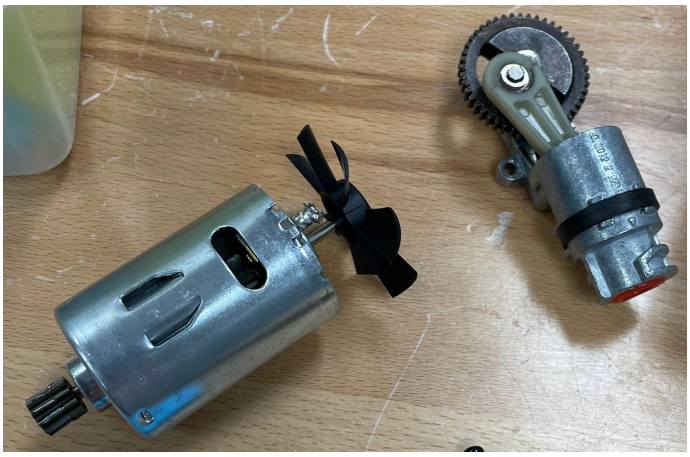
Pictured above is a section of the air tubing with no problems

    b. One of the big problems I found within the system is a gray sticky substance in sections of the tube that likely didn’t allow the air to pass through it.



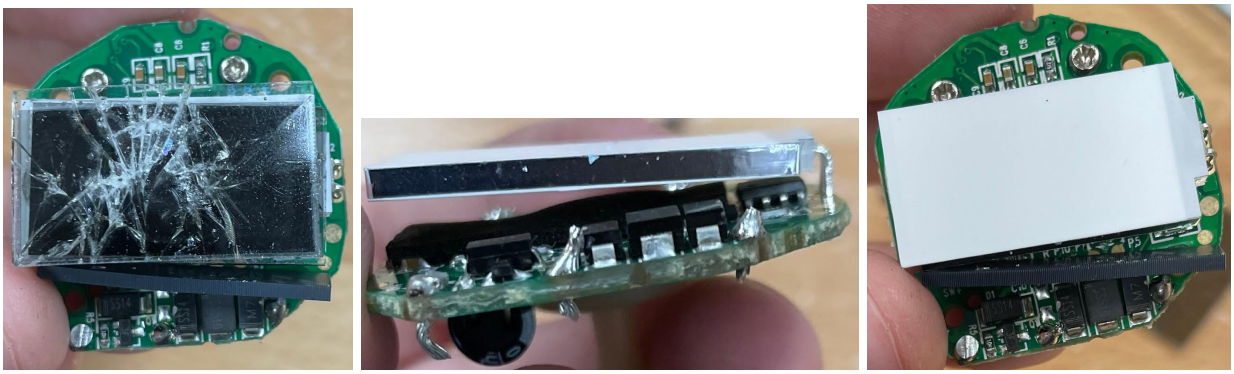
Pictured above is a section of tubing with a mysterious white substance. It is important to note that many sections of the tubing were cut, and many showed signs of the substance in various amounts

8. Unscrewed the end of the tubing from the compressor mechanism
9. 2 x one-centimeter screws were removed from the compressor mechanism
    a. Now separated into the small and inseparable “Fan” and the “Gears” sections



Pictured above are the two separated sections from the compressor mechanism.
On the left, the “Fan”, and on the right, the “Gears”
It is important to note that while these components could be broken down more, I did not have the adequate resources to stay safe while doing it

10. Took apart the Liquid Crystal Display that displayed the pressure of what was being pressurized
    a. It separated into
        i. 2 pieces of polarized glass
        ii. 6 x 1 cm screws
        iii. 1 cm by 3cm piece of internal reflection glass that allows the sides of the interface to light up
        iv. 1 cover piece of plastic
        v. 1 nozzle to find the air pressure



Pictured above from left to right is the LCD system from the top, side, and top without the shattered screens. Important components are the shattered screens on the right, the motherboard in all pictures, and the internal reflection glass in the picture on the left.

What did you learn from exploring your electronic device?

Between steps 3 and 4, I determined a potential process that is used to compress the air

- Button on the outside of the shell connects to a piece called “Startwin” that completes the circuit when pushed
- Startwin is connected to
    - Battery clip
        - a piece that takes in power from the rechargeable battery
    - The pressure gauge
    - The compressor mechanism
- Power is pulled from the battery and distributed to the startwin, compressor cylinder, and the pressure gauge
- Air is pulled in through the slits in the sides of the shell and pushed through the compressor cylinder, then through the tubing until it reaches the thing you are pressurizing
    - Some of the compressed air is pulled away from the nozzle to be read through the gauge and printed onto the screen

From exploring my device, I realized that overuse, built-up dust and oil, and a gray substance likely caused the air compressor to break. I also got to see how air goes through the entire process. I love being able to get a full understanding of complicated machines such as this one because the process allows me to have a deeper appreciation for machines and their complexity.