Supplementary Data

Bioinspired prosumer. Interaction of bioinspired design
methods in the prosumer scope

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Table 1. Results of the tests carried out according to the power coefficients

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | b (m) | Swept area (m2) | Theoretical power (P)  | Resistor (Ω) | Voltage (V) | Current (mA) | Speed (r.p.m) | Turbine Power Pt (W) | Cp= Pt/P |
| H5C30 (led 5w) | 0,057 | 0,0102 | 5,91 | 25 | 7,8 | 160 | 5762 | 1,248 | 0,211 |
| H5C30 (led 5w) | 0,057 | 0,0102 | 5,91 | 56 | 9,4 | 120 | 6153 | 1,128 | 0,191 |
| H2C25 (led 5w) | 0,048 | 0,0071 | 4,10 | 25 | 7,24 | 142 | 5075 | 1,028 | 0,250 |
| H2C30 (led 1w) | 0,057 | 0,0102 | 5,91 | 25 | 8,2 | 120 | 5870 | 0,984 | 0,166 |
| H5C30 (led 1w) | 0,057 | 0,0102 | 5,91 | 25 | 7,7 | 125 | 7000 | 0,963 | 0,163 |
| Dron (led 5w) | 0,025 | 0,0020 | 1,14 | 39 | 4,87 | 50 | 2860-2900 | 0,2435 | 0,214 |
|  |  |  | 35,28 |  |  |  |  |  |  |

Table 2. Results of tests carried out with motors

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Resistance (Ω) | Voltage (V) | Current (mA) | Motor speed (r.p.m.) | Power (mW) |
| 0 Ω | 3 | 1550 | - | - |
| 0 Ω | 3,48 | 1770 | - | - |
| 0 Ω | 4,55 | 2330 | - | - |
| 0 Ω | 5,4 | 2750 | - | - |
| 0 Ω | 6,7 | 3450 | - | - |
| 0 Ω | 7,5 | 3880 | - | - |
| 0 Ω | 8,13 | 4180 | - | - |
| 0 Ω | 8,72 | 4480 | - | - |
| 9,75 Ω | 2,25 | 54 | 1446 | 121,5 |
| 9,75 Ω | 3,4 | 87 | 2230 | 295,8 |
| 9,75 Ω | 5 | 126 | 3313 | 630 |
| 9,75 Ω | 5,8 | 147 | 3840 | 852,6 |
| 25 Ω | 1,9 | 80 | 1420 | 152 |
| 25 Ω | 2,9 | 120 | 2150 | 348 |
| 25 Ω | 4,3 | 175 | 3206 | 752,5 |
| 25 Ω | 5,1 | 208 | 3871 | 1060,8 |
| 50 Ω | 2,3 | 43 | 1450 | 98,9 |
| 50 Ω | 3,5 | 69 | 2230 | 241,5 |
| 50 Ω | 5,2 | 103 | 3333 | 535,6 |
| 50 Ω | 6,1 | 120 | 3881 | 732 |
| 100 Ω | 2,62 | 25 | 1477 | 65,5 |
| 100 Ω | 4,87 | 48 | 2738 | 233,76 |
| 100 Ω | 5,75 | 57 | 3273 | 327,75 |
| 100 Ω | 6,57 | 65 | 3770 | 427,05 |
| 100 Ω | 7,2 | 73 | 4159 | 525,6 |

Table 3. Wind tunnel results

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Resistance (Ω) | Propeller | Tunnel level | Voltage (V) | Current (mA) | Speed (r.p.m.) | Power (mW) | LED |
| - | Dron | 10 | 7.5-7.35 | - | 3930-4030 | - | LED BLUE 5W |
| 220 | 6,7 | 18 | 3720 | 120,6 |
| 56 | 5,28 | 44 | 3090 | 232,32 |
| 39 |  | 4,87 | 50 | 2860-2900 | 243,5 |
| 20 | 4,05 | 55 | 2460-2480 | 222,75 |
| 9.75 | 3,56 | 58 | 2220-2200 | 206,48 |
| 220 | C25A2H2 | 10 | 12,05 | 40 | 7250 | 482 | LED WHITE 1W |
| C30A2H2 | 11,2 | 40 | 6740 | 448 |
| C25A2H3 | 10,5 | 40 | 6770 | 420 |
| C30A2H2 | 10,9 | 44 | 6530 | 479,6 |
| C25A2H5 | 11,60 | 60 | 7014 | 696 |
| C30A2H5 | 11,1 | 60 | 6765 | 666 |
| 56 | C25A2H2 | 10 | 8,2 | 90 | 5350 | 738 | LED BLU E 5W |
| C30A2H2 | 9,25 | 105 | 6076 | 971,25 |
| C25A2H3 | 9,78 | 55 | 6400 | 537,9 |
| C30A2H2 | 9,6 | 60 | - | 576 |
| C25A2H5 | 8,91 | 100 | 5950-6000 | 891 |
| C30A2H5 | 9,4 | 120 | - | 1128 |
| 25 | C25A2H2 | 10 | 7,24 | 142 | 5075 | 1028,08 | LED BLUE 5W |
| C30A2H2 | 8,38 | 70 | 2854 | 586,6 |
| C25A2H3 | 7,2 | 107 | 5370 | 770,4 |
| C30A2H2 | 7,94 | 121 | 5810 | 960,74 |
| C25A2H5 | 7,6 | 131 | 5851 | 995,6 |
| C30A2H5 | 7,8 | 160 | 5762 | 1248 |
| 25 | C25A2H2 | 10 | 6,15 | 120 | 7070 | 738 | LED WHITE 1W |
| C30A2H2 | 8,20 | 120 | 5870 | 984 |
| C25A2H3 | 7,08 | 125 | 4825 | 885 |
| C30A2H2 | 7,88 | 100 | 5160 | 788 |
| C25A2H5 | 7,26 | 130 | 5300-5500 | 943,8 |
| C30A2H5 | 7,7 | 125 | 7000 | 962,5 |

Table 4. Luminescence test

|  |  |  |  |
| --- | --- | --- | --- |
| Angle | Candelas | Lumens | Angle (rad) |
| 90 | 4 | 7,361 | 1,571 |
| 60 | 4 | 3,367 | 1,047 |
| 45 | 4 | 1,913 | 0,785 |
| 30 | 4 | 0,856 | 0,524 |
| 90 | 40 | 73,612 | 1,571 |
| 60 | 40 | 33,671 | 1,047 |
| 45 | 40 | 19,131 | 0,785 |
| 30 | 40 | 8,564 | 0,524 |
| 90 | 60 | 110,418 | 1,571 |
| 60 | 60 | 50,507 | 1,047 |
| 45 | 60 | 28,697 | 0,785 |
| 30 | 60 | 12,846 | 0,524 |

Table 5. data of the printer used for prototyping

|  |  |
| --- | --- |
| Model | Artillery Sidewinder X1 |
| Technology | FDM (Fused Deposition Modeling) |
| Construction space | 300x300x400 mm |
| Extruder temperature | 240ºC |
| Filament diameter | 1'75 mm |
| Program | Ultimaker Cura |
| Construction speed | 30 mm/s (First five layers)80 mm/s (Subsequent layers) |
| High | 0,2 mm (First five layers)0,32 mm (Subsequent layers) |
| Tolerance | + 0, 32 mm |
| Material | PLA Ø 1’75 mm |