LED Fan

Protechnic Electric

日本総代理店

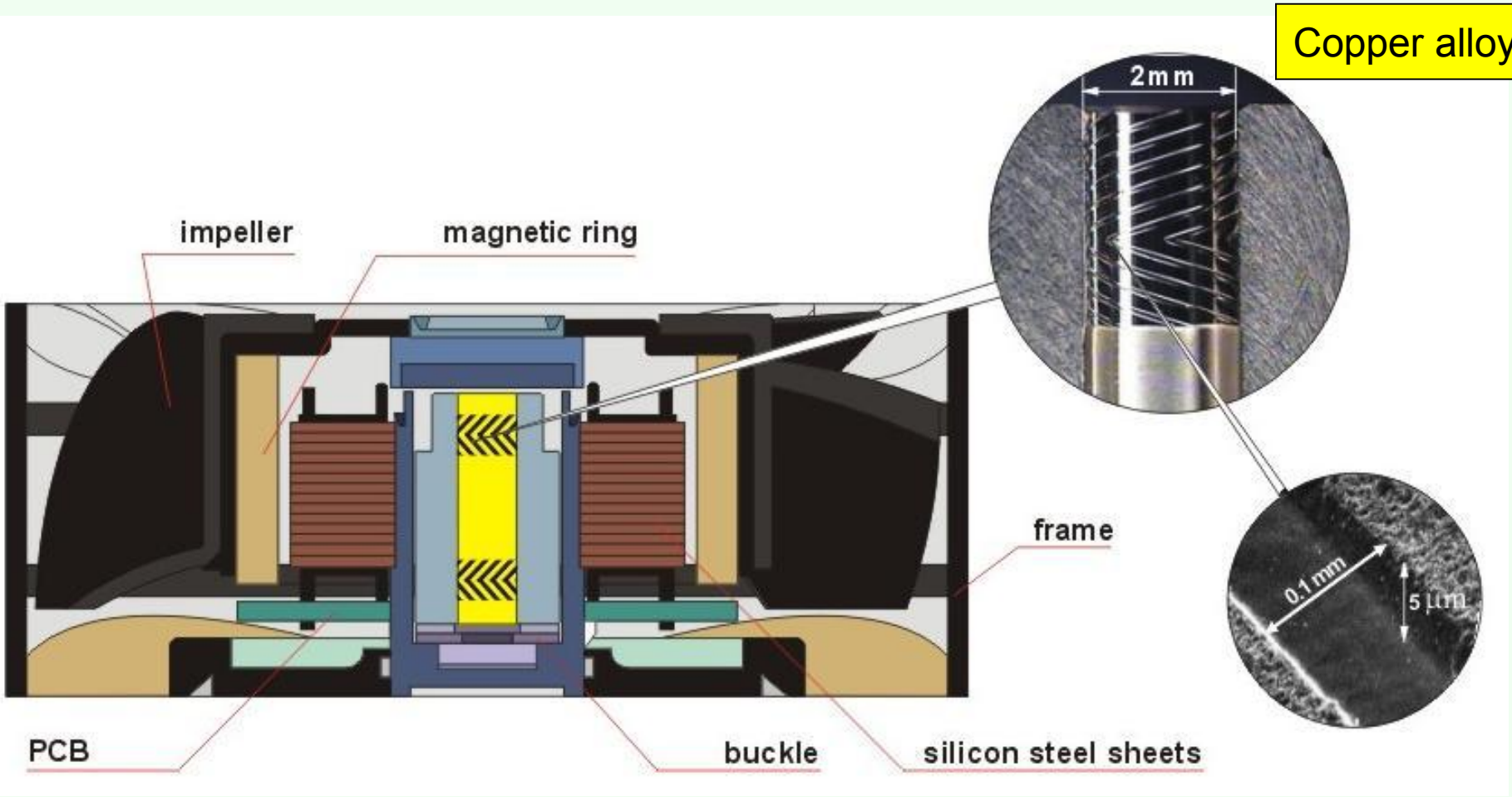
都築電気株式会社

Overview

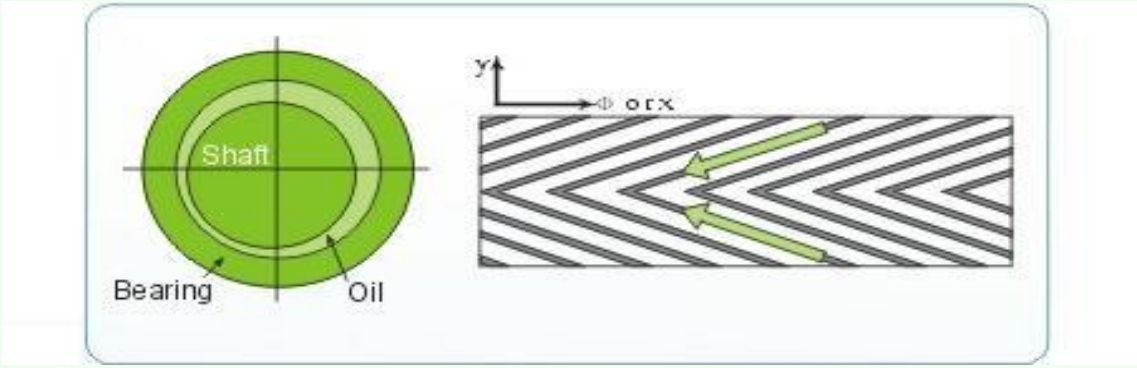
- Protechnic Fan Structure
  - FDB bearing, Seal
  - Oil Leakage prevention design
  - No Friction test
  - Dust build up prevention design
  - FDB life expectancy
  - Durability (L10 report)
  - Sound and Noise
- Protechnic Advantage
  - Active Cooling Advantages

The structure of FDB - 1

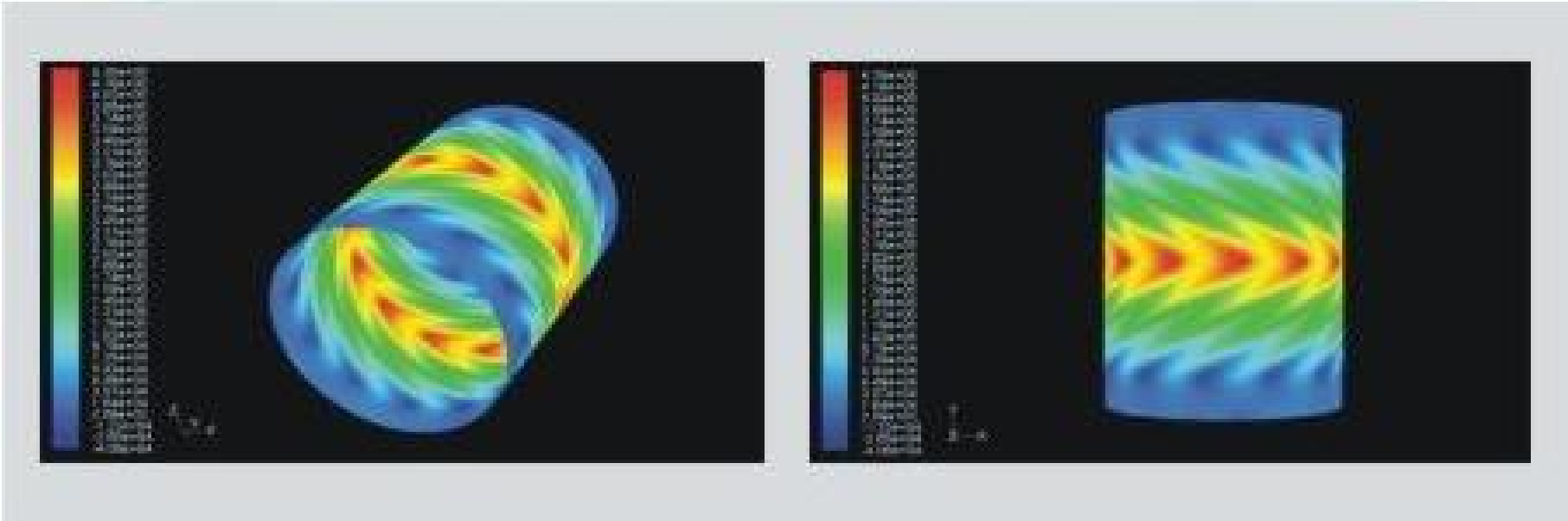
Copper alloy



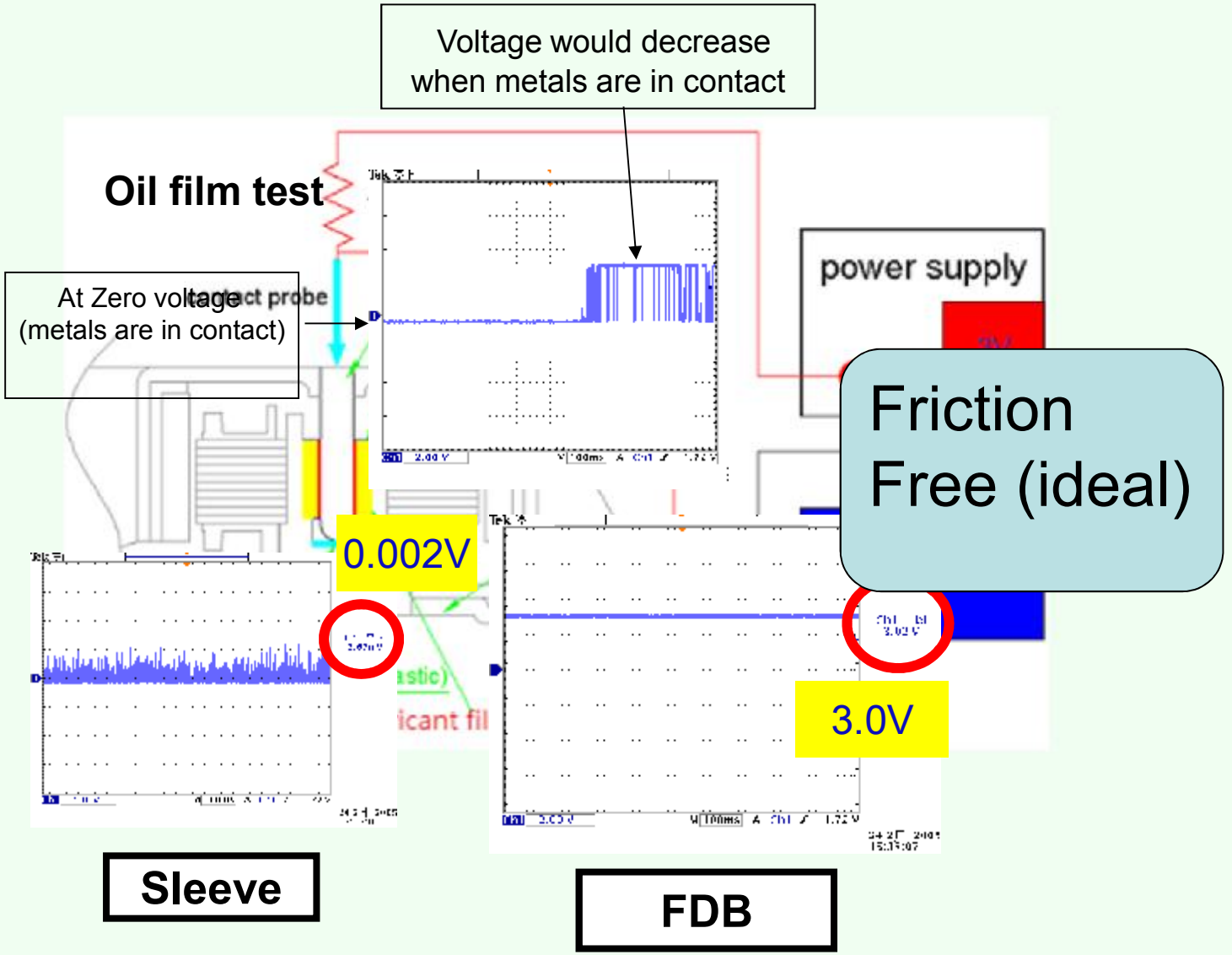
Oil Leakage prevention design



- Oil centralized to mid point to prevent leakage

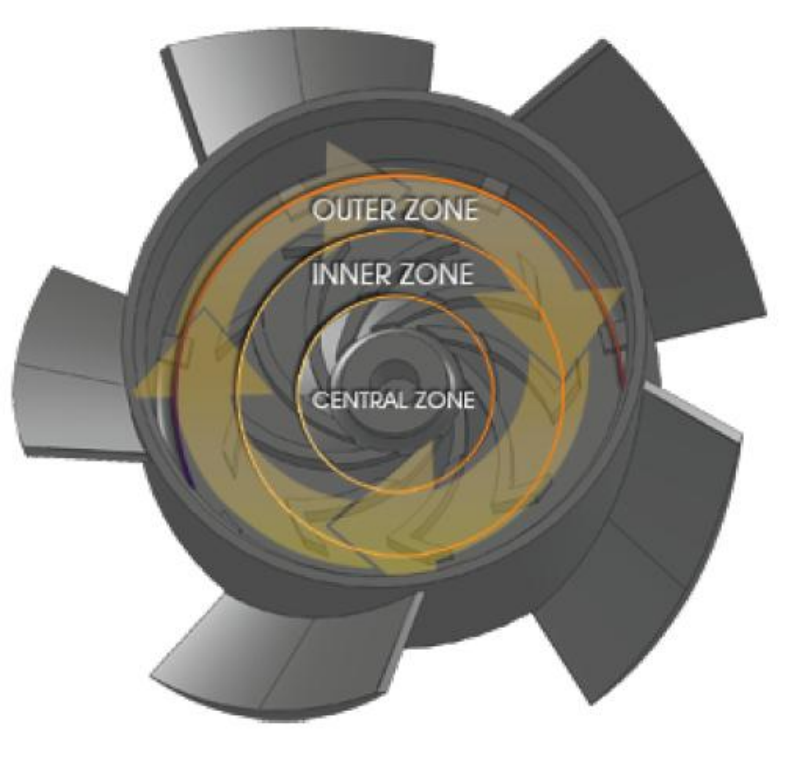


No Friction test



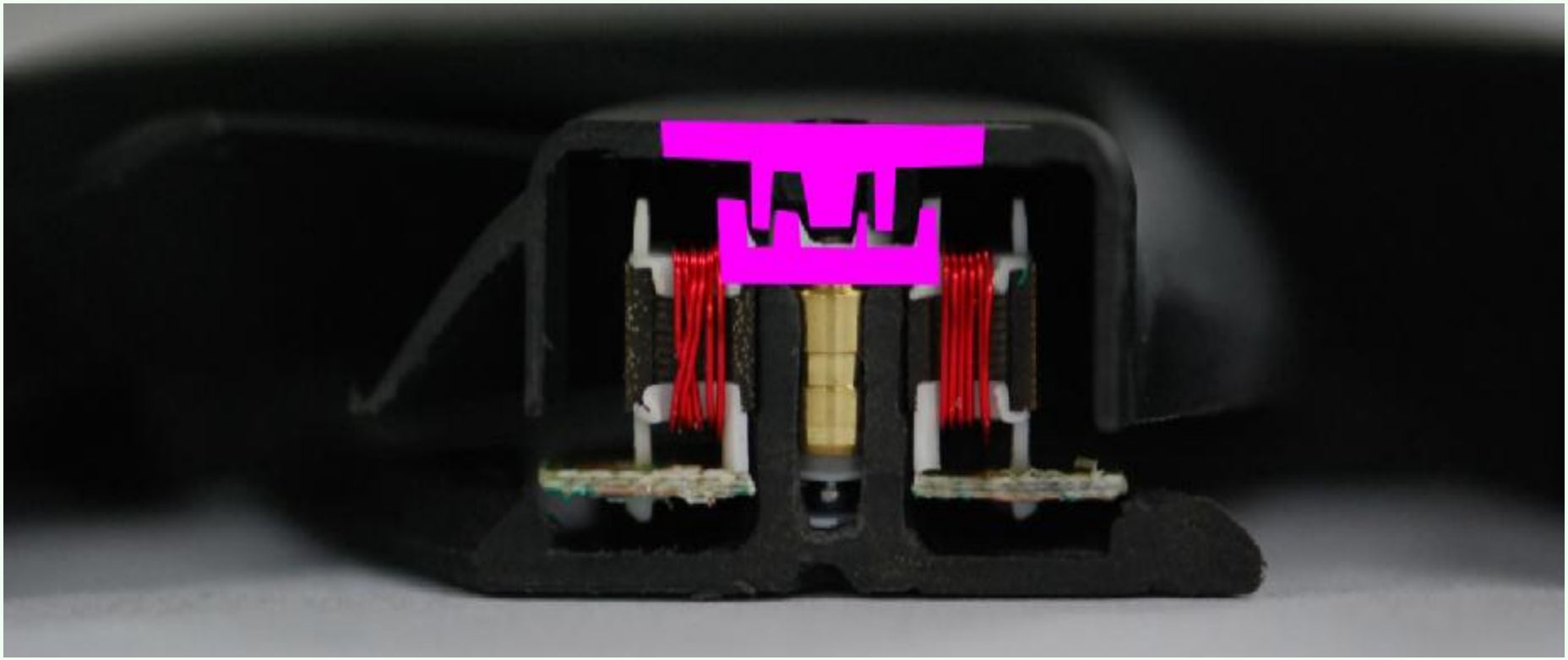
Dust build up prevention design - 1

- Protechnic patented herringbone seal design virtually eliminates the threat of dust and other solid particles from entering the bearing. This extends the operating life of the fan and contributes to a more stable cooling system within the LED housing.



Dust build up prevention design - 2

- Labyrinth seal structure design repels dust from the bearing and can extend the operating life and contribute to a more stable cooling system.



Life expectancy test of FDB (L10)

DC FAN LIFE EXPERIMENT REPORT

Available for these models with lower speed and same physical structure. All model may be followed by MGA or MGT series suffixes. This test report applies to 60x60x25 mm series as the right table.	MGT6012UF-O25				
	MGT6012HF-O25				
	MGT6012MF-O25				
	MGT6012LF-O25				
Representative Test P/N : MGT6012UF-O25					
Equipment: Oven KX-08					

◎ L10 Expectancy: 10,000 hours minimum@ fan rated voltage and the temperature of 40℃, According to the equation for Arrhenius model, MTTF ≒ 7×L10 = 700,000 hours. And we rely on a zero failure test strategy and accelerated testing technique, to determine the total test time (t) for verifying the above life estimation by the equations,

$$t = 1.036 \times MTTF \times [(Br;c) \div n]^{0.91} \div A_F \text{ , and } A_F = 2^{(Ts-Tu)/10}$$

where, (Br;c) is Poisson distribution factor with the failure number of r equal to 0 and the decimal confidence level of c equal to 0.90(90%), and

Stress/ Elevated Temperature Ts (℃)	Unstress Temperature Tu (℃)	Acceleration Factor A_F	Quantity of Test Devices n (pcs)	Poisson Distribution Factor Br;c	Required test time with zero failure t (hours)	Actual test time with zero failure t (hours)	Verified MTTF 40 ℃ (hours)	Verified L_{10} 40 ℃
90	40	32	30	2.303	2,763	7,903	2,523,917	360,560

Test Progress:

Date for Test Beginning	Date for Test Termination	Current Test Status			Current Total Test Time (hours)
2005/5/10 10:00	2006/5/17 10:00	■ In process	☐ In process (exceed requested)	☐ Termination	7,903

Herewith , we could assume as right on the basis of above test result. Besides, if the actual test time exceed the required, it comes out that those fans' L10 expectancy and MTTF are greater than the warrant. (MTTF : means Mean Time To Failures, it should be used in a non-repairable system setting. Now we show the MTTF in our life report, that's because we will not repair the failed fans during life experiment. MTBF: means Mean Time Between failures, it should be used in a repairable system setting. Basically , MTBF is equal to MTTF , they use same formula to work out a life data.)

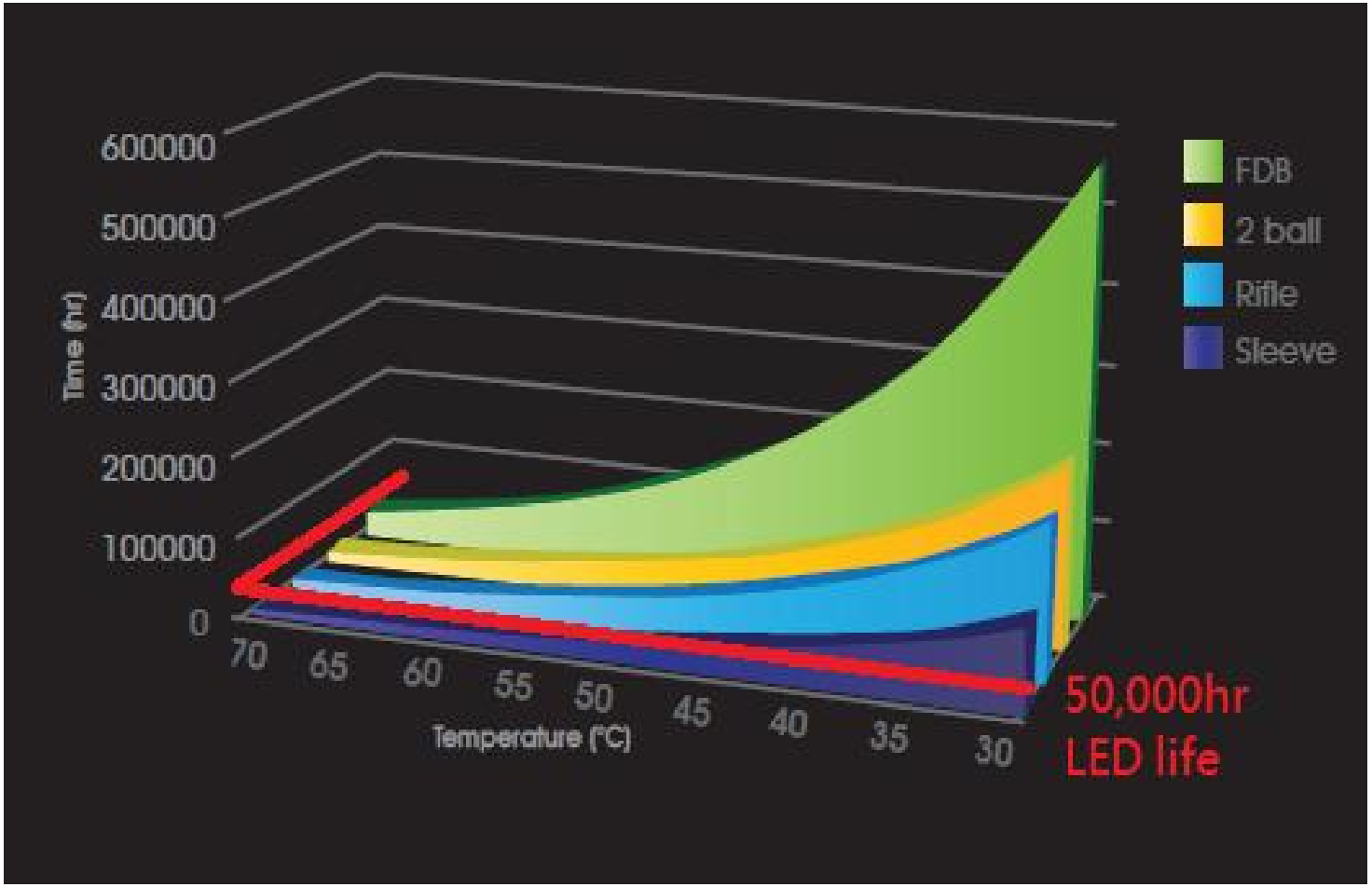
Temperature for MTTF Estimation (℃)	Acceleration Factor A_F	Estimated MTTF (hours)	Estimated L_{10} (hours)
25	90.51	7,138,715	1,019,816
30	64.00	5,047,834	721,119
40	32.00	2,523,917	360,560
50	16.00	1,261,958	180,280
60	8.00	630,979	90,140

FDB

@ 40C, ~ 360,560 Hours
~ 15,023 Days
~ 41 Years (non-stop)

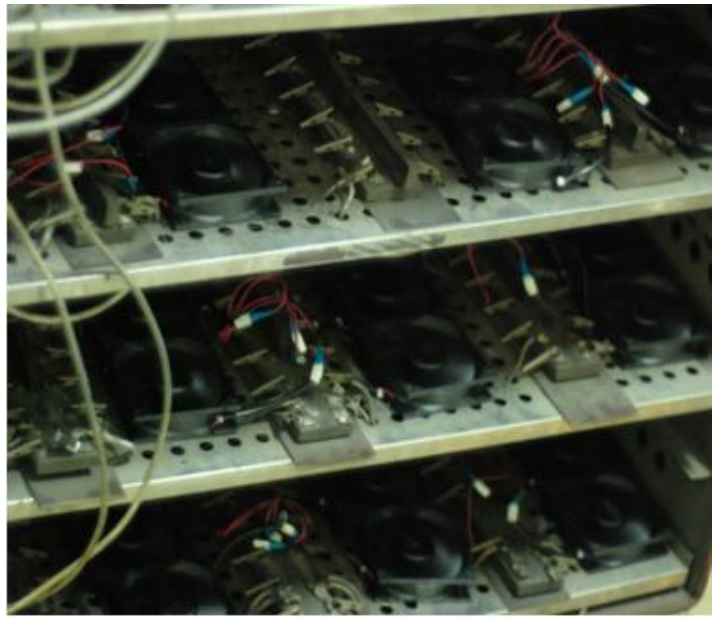
@ 60C, ~ 90,140 Hours
~ 3,755 Days
~ 10 Years (non-stop)

FDB life @ 60C
≥ 90,000 hrs

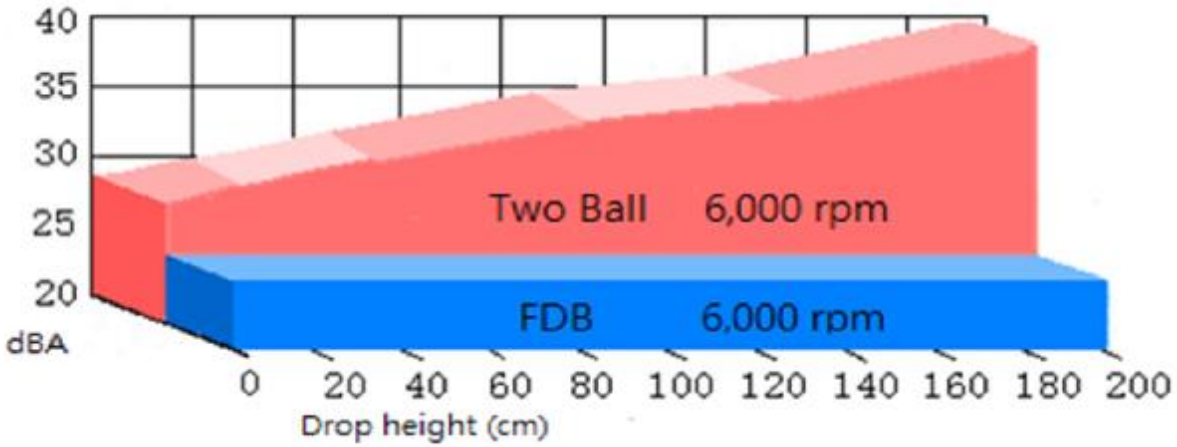


Life test include

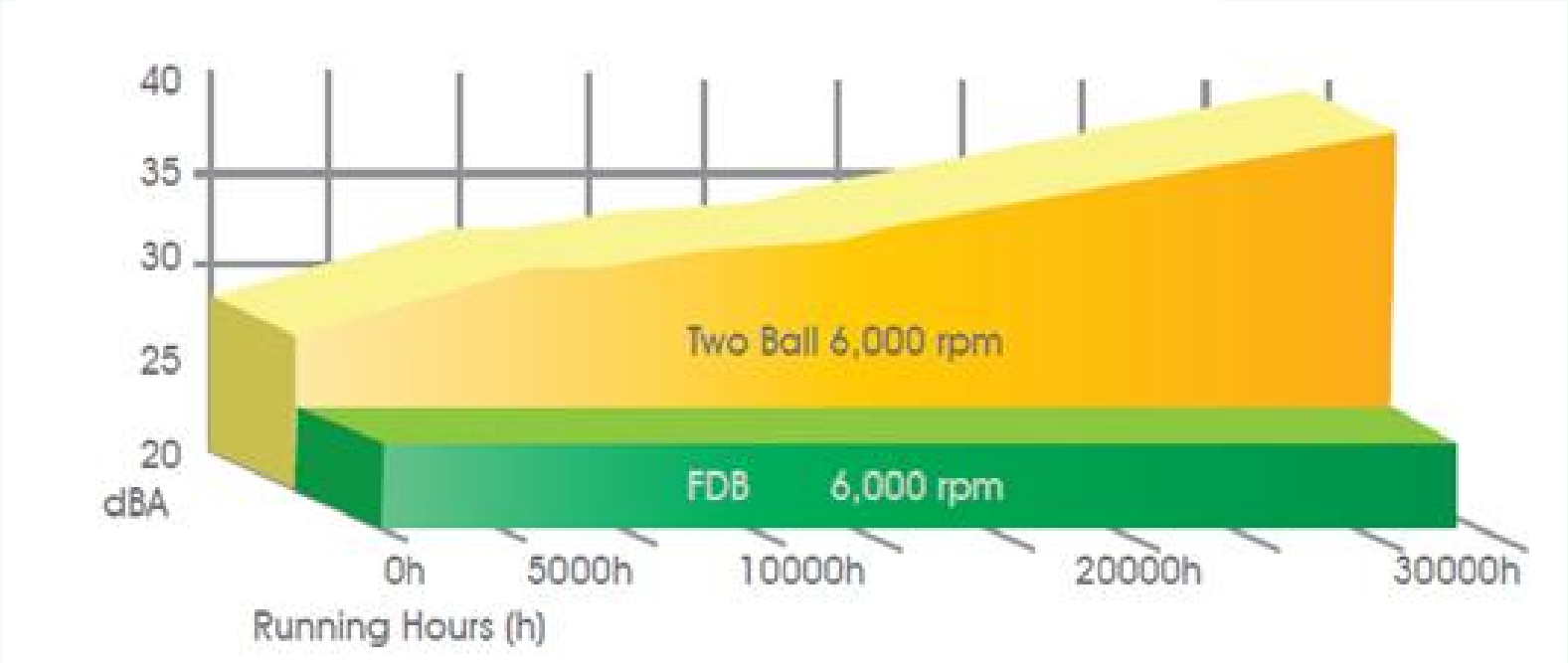
- switch on/off tests
- different orientation tests



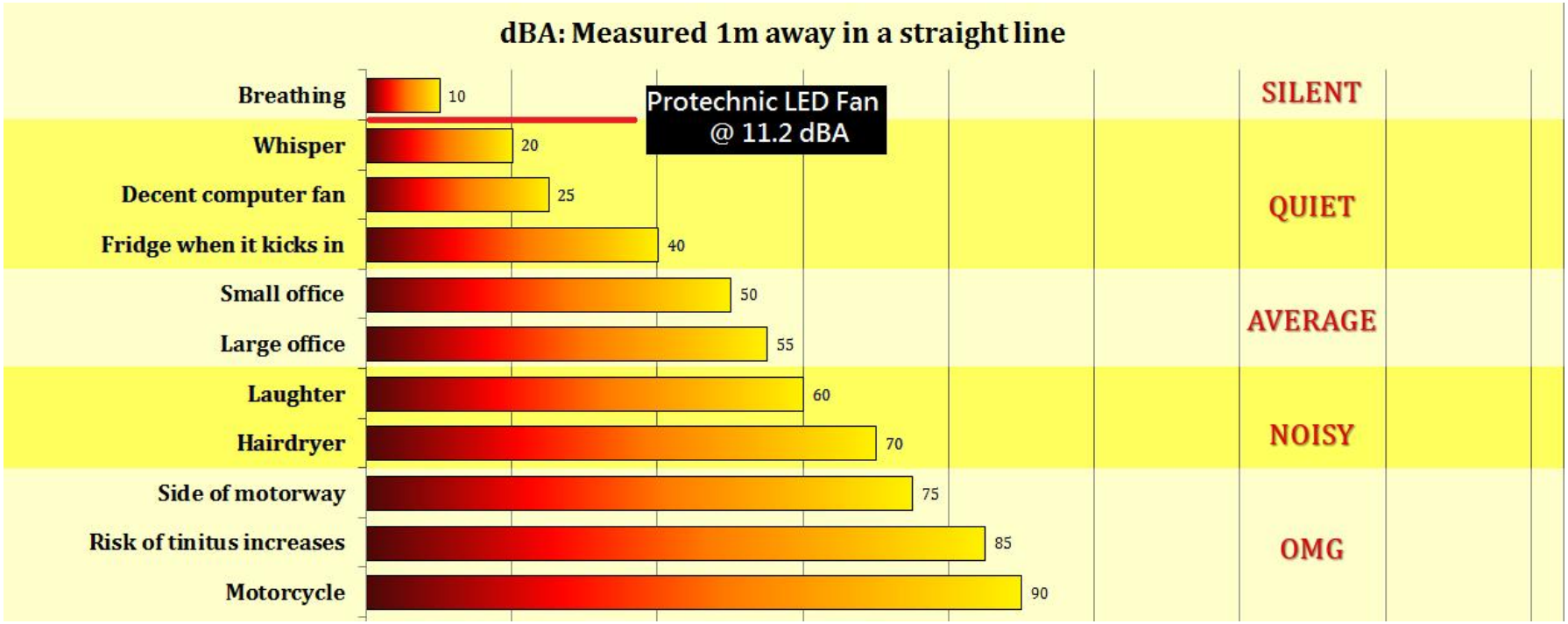
Sound and Noise



* 1.0 m between microphone and fan
* Background noise 16.8dBA



11.2 dBA
FDB fan operation noise



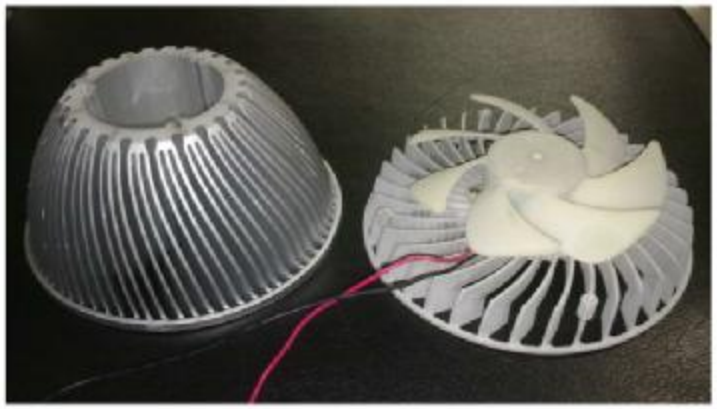
Advantage of Protechnic Product

- **Research and Development capability surpass competitors**
  - **Possess FDB(Fluid dynamic bearings) bearing patent**
    - **Specially suitable for LED lighting**
    - **Life expectancy much higher than Japanese 2 ball bearing**
      - **90,000 hours @ 60 ˚C (equivalent to more then 10 years)**
    - **Noise lower than Japanese 2 ball bearing**
      - **Less than 20dB, 1500 RPM**

- **QA Control:**
  - **100% Operational tested**
    - **20% in High temperature Monitor(80 ˚C /40min)**
  - **100% Balance tests, improve reliability and overall life**
  - **100% Vibration tests, prevent Resonance**

Active Cooling Advantage - 1

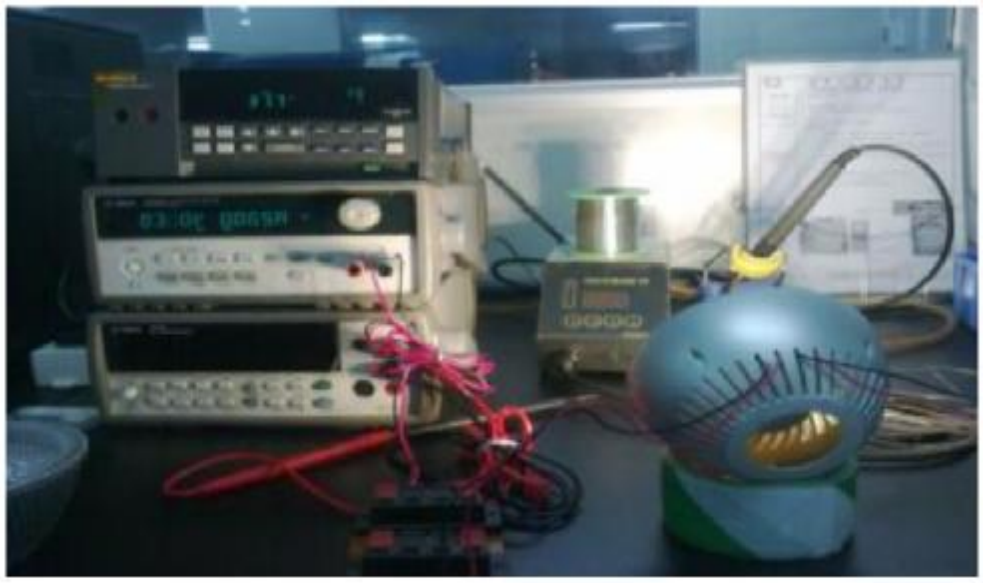
- **Reduce Heatsink Cost**
  - Our estimate on reduction: **$4.29/unit -> $3.17/unit (with fan)**

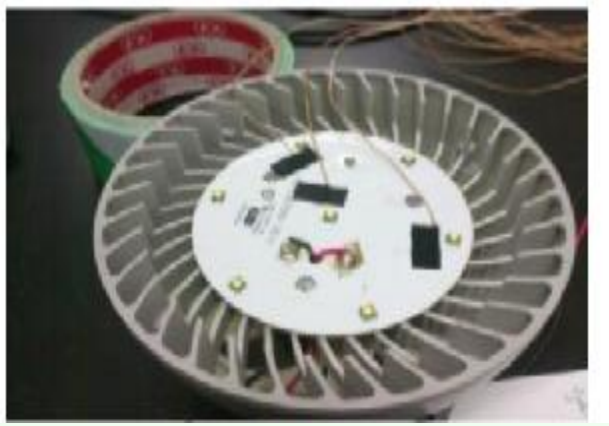


- **Create more exterior design freedom**
  - Lighting Fixture exterior choices (Plasitc instead Aluminum)

Active Cooling Advantage - 2

- **Increase Thermal Performance**
  - No longer limited by the passive aluminum in term of wattage and output lumen
  - Example as below: 18W PAR38 has 15 degree C difference
    - Extend LED life
    - Support higher wattage
    - Reduce LED chips – can drive LED harder



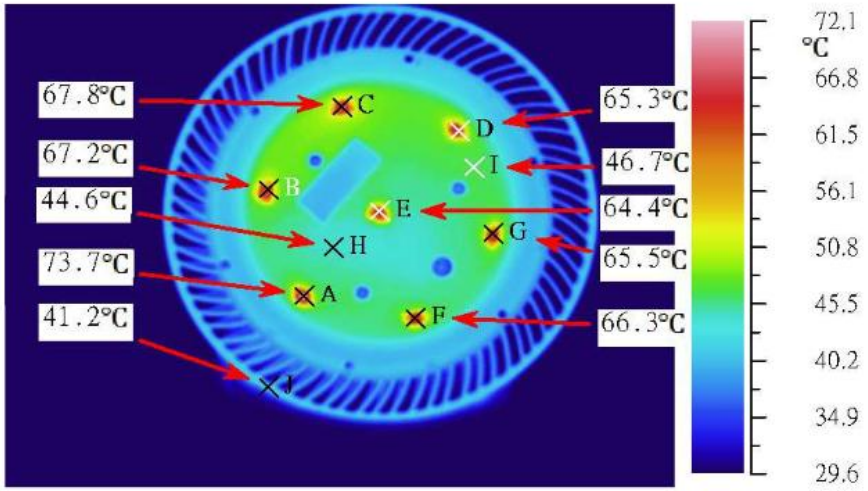


Active Cooling Advantage - 3

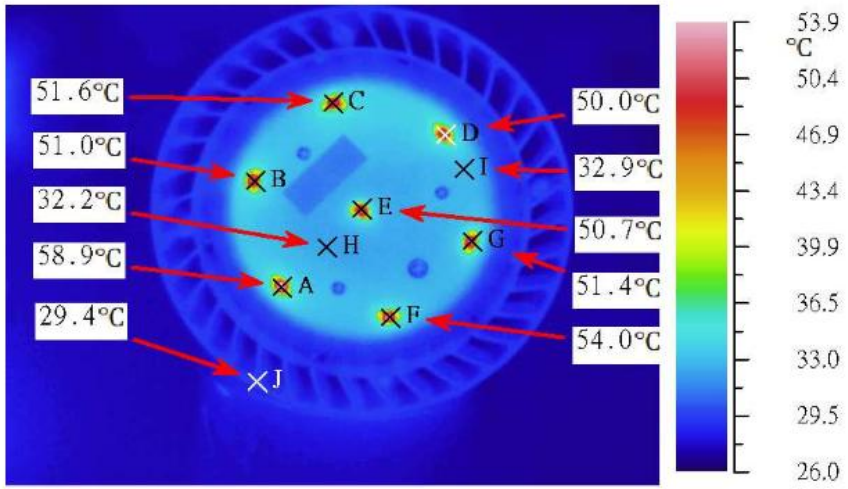
18W PAR 38 Thermal Solution Comparison

ITEM	point	Original PAR38 Passive	Modified PAR38 With our fan
Temperature (Room Temp 24.9℃)	A	73.7℃	58.9℃
	B	67.2℃	51.0℃
	C	67.8℃	51.6℃
	D	65.3℃	50.0℃
	E	64.4℃	50.7℃
	F	66.3℃	54.0℃
	G	65.5℃	51.4℃
	H	44.6℃	32.2℃
	I	46.7℃	32.9℃
	J	41.2℃	29.4℃
Weight	Heatsink	351g	95g
	Total Mass	679g	316g

Original PAR38



Modified PAR38



Active Cooling Advantage - 4

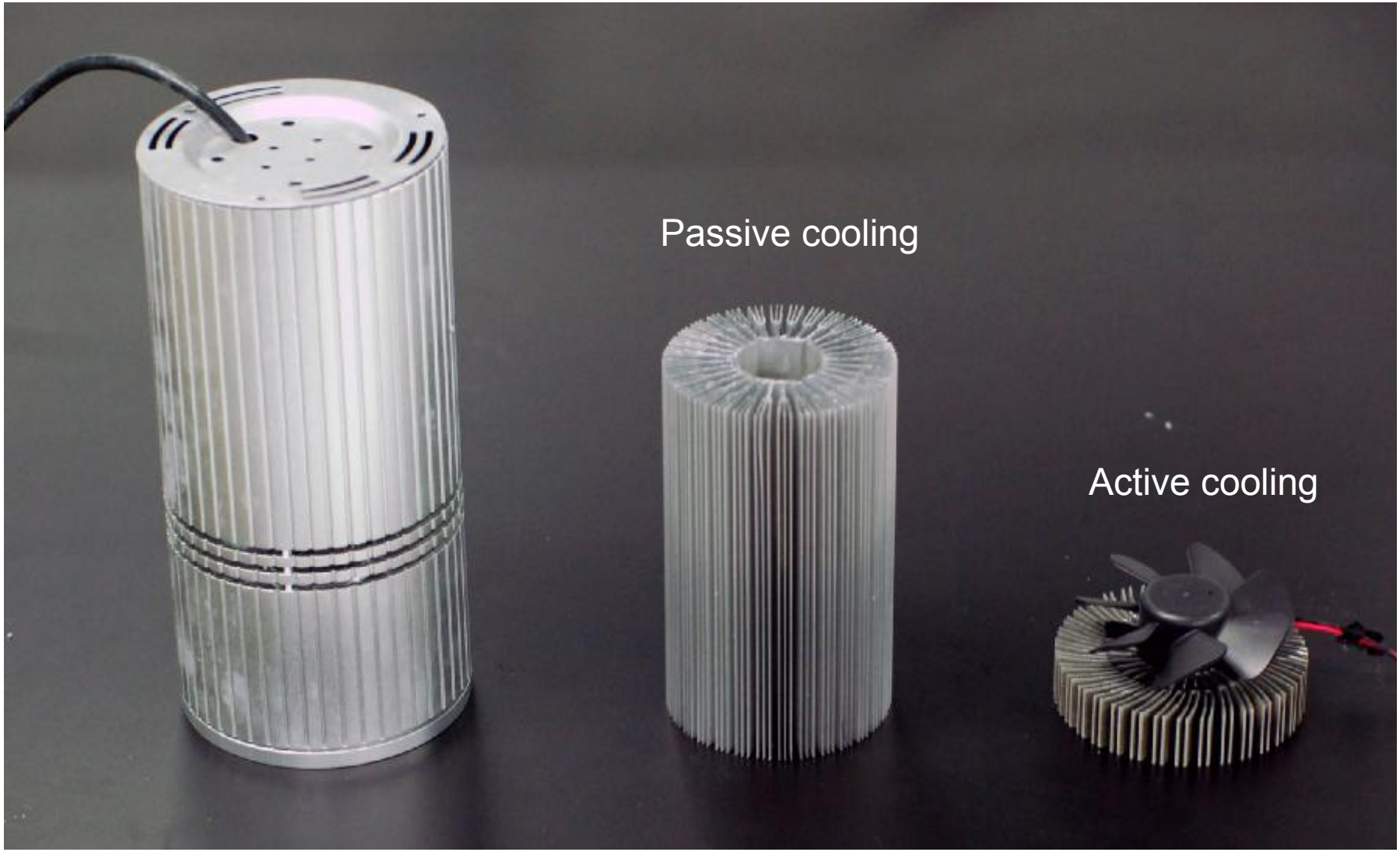
Reduce weight - Aluminium

- Reduce weight of total LED lighting fixture by 50%
- Easier for installer, even reduce complication of heavy lighting fixture
- Aluminium material cost

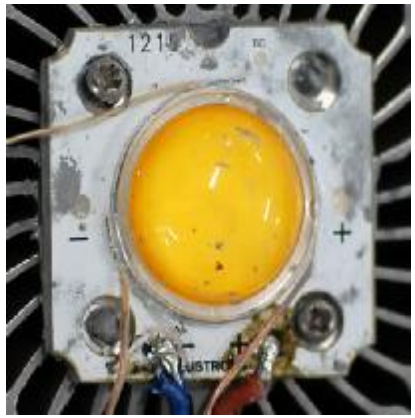
18W PAR 38 Thermal Solution Comparison

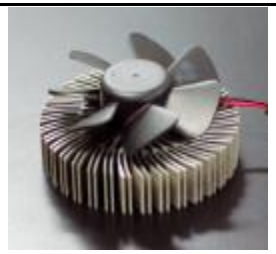
ITEM	point	Original PAR38 Passive	Modified PAR38 With our fan
Weight	Heatsink	351g	95g
	Total Mass	679g	316g

Active Cooling Advantage - 5



Active Cooling Advantage - 6



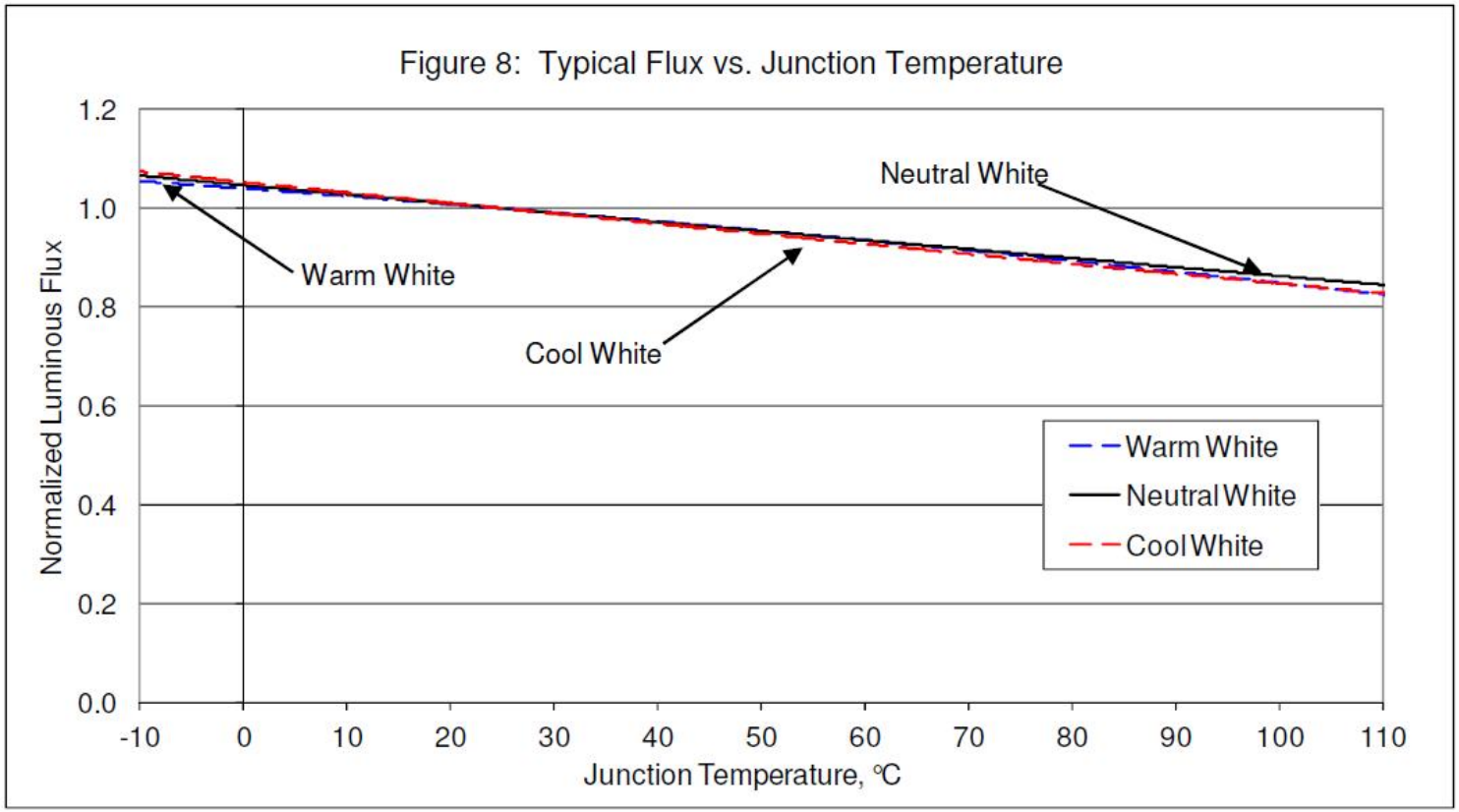
	Passive Cooling	Active Cooling	
Model 30W			
Heatsink Weight (g)	540	170	170
Max. Tcase	84.3 ℃	55.1 ℃	68.8 ℃
Noise	-	11.7 dB A ,0.25m	11.2 dB A 0.5m
Life span @40℃	-	390,000hrs	still under testing

1/3 of original weight

Active Cooling Advantage - 7

- **Increase Lumen output by lowering the temperature.**

Typical Light Output Characteristics vs. Temperature




R&D Center


Production Line

Thank you