

# CHARGE

December 2017

A Technical News Journal from Deki Electronics Ltd

## Editor's Desk

Dear Reader,

Many of you are aware that Deki is India's largest manufacturer of plastic film capacitors and that 25% of Deki's turnover comes from new products.

Recently Deki has launched the motor run capacitor used in fans that offers the quality conscious customer a very good alternative. This issue of Charge covers this capacitor in some detail to give you a good understanding of what it is about.

On a non-technical note, Deki took up the call of the Prime Minister for a Swachh India from the day it was announced. This year we cleaned the park outside the factory. The idea is to take ownership of this park and install dustbins all over so that people who use the park don't litter it. We do hope that they will use the dustbins and keep the park clean. We also planted Ashoka trees outside the factory premises which should work not only as a sound barrier but also air filter.

As usual, do write in with your suggestions and comments on this issue of Charge.

*Anil Bali*

## Mr Vinod Sharma, Electronics Man of the Year 2016-17

**M**r Vinod Sharma, our Managing Director, was awarded the Electronics Man of the Year 2016-17 recognition by Elcina-EFY. He joins industry stalwarts like Mr Ratan Tata and Mr N. R. Narayana Murthy similarly honoured in the past.

The award recognises Mr Sharma's efforts to drive the growth of electronics manufacturing in India while simultaneously establishing a supportive manufacturing eco-system.

Speaking on the occasion, Mr Sharma recounted his journey with ELCINA and how the industry was ready to face challenges and make India proud. He affirmed his commitment towards helping in policy making to help Indian component manufacturing become strong using the inherent brain, brawn and will power in abundance in India.



Mr Vinod Sharma, MD, Deki Electronics Ltd, receiving the award

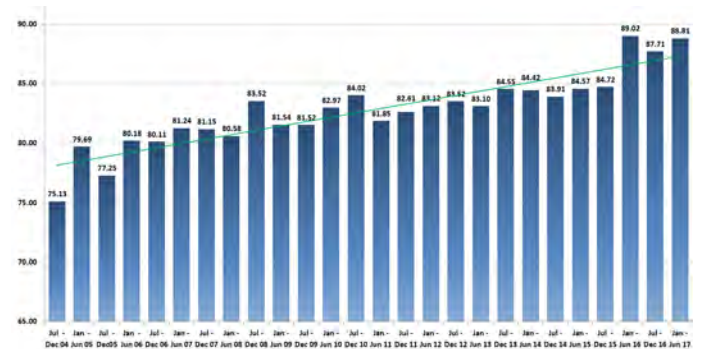
## External Customer Satisfaction Survey

**T**he results of the most recent Customer Satisfaction Survey are in and we are happy to share that consistent growth in the composite score has been maintained.

Starting from a level of 75% when we started out in 2004, the Jan-Jun 2017 survey came in at 88.81%. This is the result of our focus on two points that our customers want us to work on for the six months following a survey round.

Based on the latest score we have revised our target to 90% from the earlier 85%, based on the most recent three satisfaction surveys.

We hope to continue measuring up to the high standards that our customers and we, ourselves, set for us.



## Deki Awarded 2nd Prize for Environment Management System

**I**t was a double delight for Deki at the Elcina-EFY 2016-17 Awards as the company also won the 2nd Prize for Excellence in Environmental Management (Large Scale).

The award recognises the reduction in generation of solid waste and emphasis on the reuse of packing materials and recycling of plastics at Deki. The jury also considered Deki's CSR activity of supporting vocational training of girls from economically weaker sections of society as worthy of mention in the award citation.

The award will, undoubtedly, motivate the team to give their best in protecting the environment even further.



Mr P Shanker Raj, Mr Anil Bali and Mr Rajesh Maurya received the prestigious award on behalf of entire Team Deki

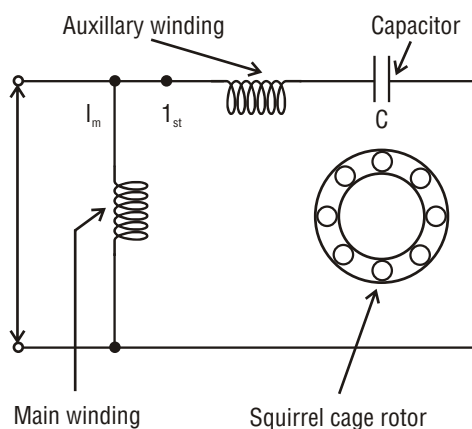
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## Fan Motor Capacitors - An Application Based Innovation

Electric motors are the most common and simple machines which find application in almost all appliances which we have today. Single-phase induction motors are simple, robust and reliable. They are used in enormous numbers especially in domestic and commercial applications.

Normally single phase induction motor is used in ceiling Fan. We know that for the working of any electrical motor whether its AC or DC motor, we require two fluxes as, the interaction of these two fluxes produced the required torque, which is desired parameter for any motor to rotate.

Single-phase induction motors are not self-starting without an auxiliary stator winding driven by an out of phase current of near 90°. Once started the auxiliary winding is optional. The auxiliary winding of a permanent-split capacitor motor has a capacitor in series with it during starting and running.



The capacitor shown in above picture is known as Fan Motor Run Capacitor. Run capacitors are designed for continuous duty while the motor is powered, which is why electrolytic capacitors are avoided, and low-loss polymer capacitors are used. Run capacitors are mostly polypropylene film capacitors and are energized the entire time the motor is running. Normally Fan Motor Run capacitors are rated in a range of 1.5 to 10  $\mu\text{F}$ , with voltage classifications of 370 V or 440 V. If a wrong capacitance value is installed, it will cause an uneven magnetic field around the rotor. This causes the rotor to hesitate at the uneven spots, resulting in irregular rotation, especially under load. This hesitation can cause the motor to become noisy, increase energy consumption, cause performance to drop and the motor to overheat.

### Electrical stress across this capacitor

For designing the reliable capacitor according to the application, we studied the application first and analysed the electrical stress across the capacitor.

We select two different input voltage ranges 230 & 300 Vac.

When the fan was subjected to 230 VAC operating voltage, the stress on capacitor observed varies from 155 V to 415 V operating through Steps 1-5.

When fan was subjected to 300 VAC operating voltage, the stress on capacitor observed varies from 193 V to 474 V operating through Steps 1-5.

Thus the input condition will vary then the stress will also vary accordingly. It is shown in the waveforms in the next column.



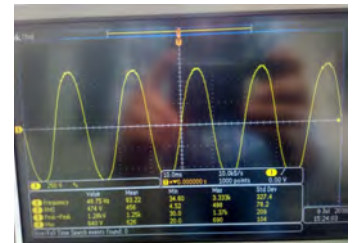
Stress across capacitor at step 1 and 230 V AC Input



Stress across capacitor at step 5 and 230 V AC Input



Stress across capacitor at step 1 and 300 V AC Input



Stress across capacitor at step 5 and 300 V AC Input

### How to Choose the Right Capacitor

as we have seen in upper waveforms that maximum voltage is coming up to 415 at Normal input voltage (230~240 VAC), as it is a AC voltage so corona discharge may occur due to air packets inside the capacitor, corona Discharge is, A small but locally intense electrical discharge that injects charge into the insulating film adjacent to edges of metallization or a location where air is trapped between foil/metallization and the film. The discharge is caused by a voltage gradient large enough to ionize molecules in either the film or small air pockets. Each discharge does some small but cumulative damage to the film. Corona is an important consideration for AC and/or pulse applications where the cumulative damage can rapidly accrue and cause dielectric failure. For film/foil parts this will result in a short circuit. For capacitors employing metallized film the "clearing" around the dielectric failure sites results in progressive capacitance loss.

### CORONA EFFECT / CORONA DISCHARGE...



Loss in the capacitor value leads to the decrease in the speed as well as torque of the Fan motor.

Deki does some controlled heat treatment to remove the air packets inside the capacitor. The advantages are:

1. No corona discharge
2. Better capacitance stability
3. Better life of the fan.

We have tested our capacitor according to IS 1709 and IEC 60252.

For more details please contact [tech@dekielectronics.com](mailto:tech@dekielectronics.com).

## Fan Motor Capacitors - An Application Based Innovation

### FAN MOTOR RUN CAPACITOR

#### Construction

- Metallised polypropylene film
- Plastic can filled with resin
- Dry type

#### Features

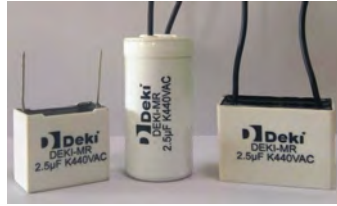
- Self-healing properties
- Low dissipation factor
- High insulation resistance

**Typical applications:** For general sine wave applications, mainly as motor run capacitor.

**Terminals:** Insulated flexible PVC copper wire, 0.5mm<sup>2</sup> minimum.

**Capacitance value range:** 1.0µF-10.0 µF

**Rated voltage (AC):** 440 V



#### Technical data and specifications

Reference standards: IS-1709 & IEC 60252

Climatic category: 40/85/21

Rated capacitance Range CR: 1.0µF-10.0 µF

Tolerance T<sub>x</sub>: 5%, 10%

Rated voltage V<sub>rms</sub>: 440 V AC

Rated frequency f<sub>r</sub>: 50/60 Hz

#### Testing specifications

Voltage Proof Test (Between terminals): 660V AC for 10 sec

Insulation resistance R<sub>ins</sub> or: 3000 sec

time constant at 20 °C,

rel. humidity 65% (minimum as-delivered values)

Dissipation factor tan δ at 20 °C: ≤0.002 at 50 Hz

Endurance Test at 85 °C: 1.25×Rated Voltage for 500 hours

Endurance Test Criteria: ΔC/C ≤5%, Tan δ ≤0.002

## Fan capacitor manufacturing glimpses

Deki has the best manufacturing facility for fan capacitors. Here are some glimpses of the process:

**Winding:** Winding is the process of rolling the films in a cylindrical shape. The tension of films are maintained to avoid shrinkage or break of film. The pressure roller is used to avoid air gaps between films so as to make the winding effective. Aluminium foil is fed from one end for the purpose of film de-metallization. De-metallization is done at the sealing area to ensure effective sealing. It should be ensured at winding that there is no scratch and wrinkle on the surface of the films.

Deki has highly sophisticated automatic winding machines that provide the desired quality.



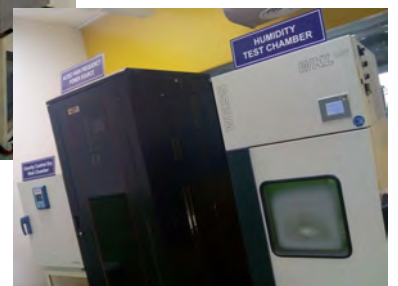
**Spray:** Spraying is the process of making end contacts with the metallized layer. To make the strong contacts with lead wire sprayed surface should be even.

Deki has a fully automated spray machine to make sure that the spray surface is even and spray quality is good.



#### Testing Facility at the Deki's Research Centre

Deki has its own Department of Science and Industrial Research (DSIR) approved lab, which helps the design team to check the robustness of capacitor design. All new developments are tested at elevated test conditions prior to launch.



## Annual Day Celebrations

Team Deki celebrated its annual function on 18th October. The park facing the Deki factory wore a festive look and played host to participants and viewers alike.

The celebrations started with a group lunch followed by senior management lauding the efforts and contributions made by the team members over the past year and sharing the Deki vision for the year ahead. Then came the awards segment which saw various trophies and gifts presented to the top performers. These included best attendance, best suggestion, maximum suggestion in a year, work performance and the annual games.

Next on the agenda was a cultural extravaganza organised by the Cultural Committee which showcased the singing and dancing talent within the company.

All in all, it was time well spent off the shop floor and the normal routine. Who says we are only about manufacturing? We do know how to have fun too!



## Employee Suggestion Scheme

The employee suggestion scheme at Deki has seen consistent growth since inception in 1999 with 20,057 suggestions implemented till date.

The scheme is very simple with an employee filling a suggestion form mentioning the present process, the new or



Average employee suggestions per month

revised process proposed and the accruing savings /benefits from it. The suggestion reaches the suggestion committee with the remarks of the section-in-charge. The committee deliberates during a weekly meeting and selects suggestions that can be implemented. Accepted suggestion are rewarded every week.

In 2016-17 we had 446 implemented suggestions per month which worked out to 10.4 suggestions per employee per annum. In the first six months of 2017-18 we have averaged 384 implemented suggestion per month which is about 8 suggestions per employee per month. Coupled with results of the Employee Satisfaction Survey, this is ample indication of a highly motivated Deki work force.

## Swachh Bharat Swachh Deki - Clean India Clean Deki

Inspired by the Prime Minister's Swachh Bharat mission, Team Deki went on a Clean India Clean Deki drive from 27th to 28th September 2017.

During the drive, Team Deki cleaned the public park facing the manufacturing unit and Ashoka trees were planted along the front periphery of the Deki premises. The entire team also took an oath to keep their surroundings clean.



## Training in Deki

At Deki, training receives the utmost importance and has grown consistently with close to 3% of time spend on it. Detailed stage-wise training imparts knowledge of the process and the machines. This is followed by a written test in which a minimum of 80% at critical stages is required to qualify to run the machine. Deki's training modules have been well recognised and serve as a benchmark for component manufacturers.



Training hours per month