

Sharp Edge Coverage (SEC) – Resolves Common Challenges During Conformal Coating Application

What Is SEC?

Sharp Edge Coverage (SEC) is defined as the ability to conformally coat an assembly with the intention to cover and protect the entire surface of the component including the edges.

HumiSeal SEC product line.

Coatings have been formulated to improve sharp edge coverage by reducing flow and slump to controlled levels using idealised viscosities. The most beneficial effects were seen in conjunction with solvents; presumably the evaporation of solvents during the spray process also increased the speed of viscosity increase during drying processes. Excellent results were achieved with solvent based rubber coatings. Materials were used to provide reduced slump during drying, and solvent choices made to exacerbate the effect.

Multiple rubber-based coatings were prepared; a currently altered materials to provide idealised control of viscosity. All coatings were applied onto standard test boards, comprised of a mix of SMT components and geometries.

Application was using an atomised spray process. Each coating was applied using the maximum wet coating thickness that was possible in one layer. It was apparent that the experimental coatings could be applied at higher thicknesses without excessive flow and migration – this is important to provide good application accuracy.

After full cure, the sharp edge coverage of all coatings was assessed by two routes:

- Cross sectioning of various SMT components and subsequent microscopic analysis.
- Investigation of insulation properties using water spray

Populated test boards were coated with either an unmodified rubber coating, or a rubber coating with optimised coverage. The characteristics of the unmodified coating limited application thickness to approximate average of 45µm due to excessive flow. Whereas the optimised coating had minimal flow, thus was able to be applied at higher thicknesses. 75µm was applied, which represents highest suggested thickness per IPC CC 830 work standard.

Figure 1. below shows the cross-section lines. Crosssections were cut through centre of a QFP leg, and through edge (C1, C3) and centre of an SMT resistor.

Figure 2. shows the comparison between the coverage of each coating on QFP legs. The unmodified coating is seen to have very low coverage on the bend of the leg, with the coating slumping significantly onto the foot, where thicknesses of 51µm were seen. However, the edge coverage optimised coating is seen to have an even coverage of the leg, showing thicknesses of approximately 80µm on all areas, and demonstrating minimal slump down the length of the leg.

Figure 3 shows the comparison between the coverage of the unmodified coating on SMT 0604 resistors along cross section lines C1 and C2. The unmodified coating is seen to have very low coverage on the top edges, with the coating slumping significantly onto the pad where thicknesses of >100µm were seen.

Figure 4 shows the coverage of the edge coverage optimised coating. Thicknesses of 70µm are seen on the top edges, and 90µm on the pad.

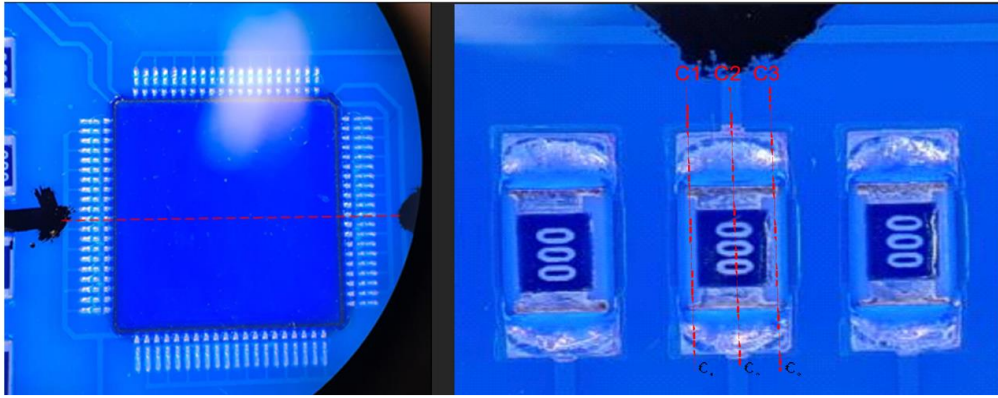


Figure 1. Cross section location. C1, C2, C3

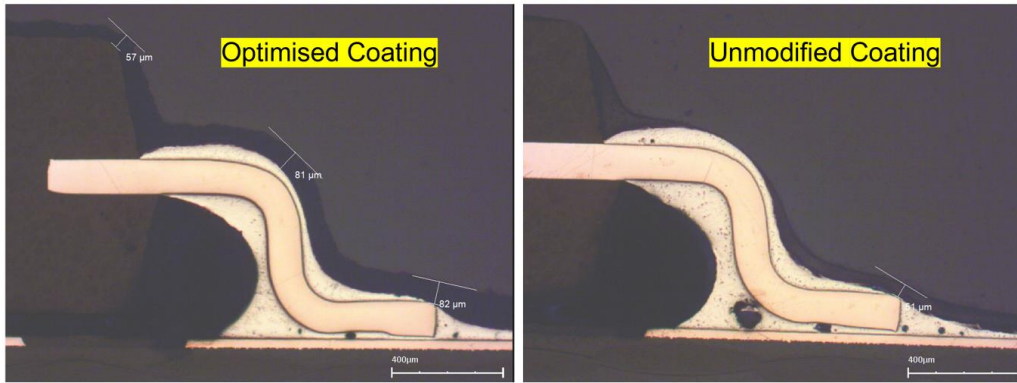


Figure 2. Coverage comparison on QFP legs

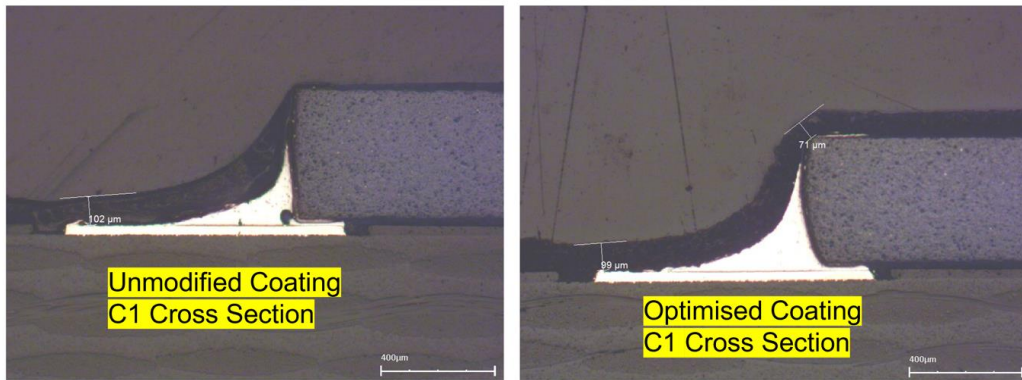


Figure 3. Coverage comparison on SMT Resistors. C1 location

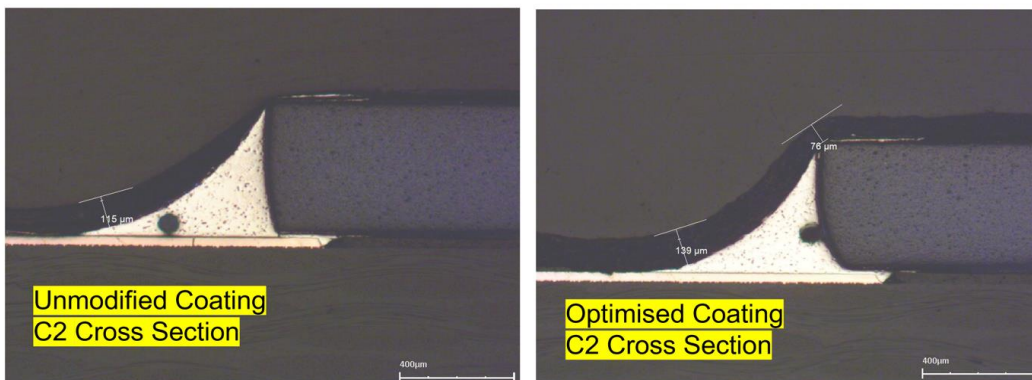


Figure 4. Coverage comparison on SMT Resistors. C2 location

The summary of the coating thicknesses is given in the following Table 1:

Table 1 – approximate coating thicknesses in varying areas for unmodified and optimised coatings

Location	Unmodified Coating	Edge Coverage Modified Coating
Flat surface	~ 45um	~75um
QFP Leg Bend	no coating	~80um
QFP Foot	~50um	~80um
0604 Resistor Top Edge	C1 – no coating C2 ~5um	C1 ~ 70um C2 ~ 80um
0604 Resistor Base	C1 ~100um C2 ~ 115um	C1 ~ 90um C2 ~ 130um

APPLICATION METHODS

Both materials are compatible with various selective coating equipment machines. Tests were performed with all types of valves. To achieve required SEC protection coating process parameters may require optimisation.

	Spray	Film coat	Jet	Dispense
1B59SEC	Yes	In progress	Yes	Yes
1A33SEC	Yes	Yes	Yes	Yes

CONCLUSION

Coatings with improved sharp edge coverage continue to be developed and show great promise to provide easy to apply coatings with significantly increased protection against moisture ingress and corrosion.

REFERENCES

[1] White paper – “Conformal Coatings – New Solutions to Existing Problems”. Chris Brightwell, HumiSeal Europe – A Chase Corporation Company

Additional information: See HumiSeal Blogs and videos.

- HumiSeal Blog
 - o The Next Stage of Total PCB Protection: Sharp Edge Conformal Coatings
<https://blog.humiseal.com/sharp-edge-solutions>
 - o Sharp Edge Coverage: Solving 3 of the Biggest Problems Facing Modern Conformal Coating Application
<https://blog.humiseal.com/solving-3-of-the-biggest-problems-facing-modern-conformal-coating-application>
- SEC Video (YouTube location)
<https://www.youtube.com/watch?v=i7cp4Vpmjx8>