

## Case study

# Prove of Superior Coatings Quality with Dynamic Contact Angle



Photo by Karl JK Hedin on Unsplash

Hydrophobic and superhydrophobic coatings have gained a lot of interest due to their ability to prevent dirt and dust accumulation and because of easy cleanability.

Hydrophobic coatings on glass are especially interesting as glass is used in screens, windshields and lenses to name a few. Contact angle measurements offer an excellent method to determine the quality of your coatings. However, sometimes the static contact angle alone is not able to distinguish the differences between different coatings.

In this case study, it is shown how dynamic contact angles can be used to gain additional information on your surface.

**Purpose of the study** is to show that a new coating formulation will give better coating quality on lenses. Visual evaluation of the new coating had already shown it to be superior in terms of cleanability when compared to both old and the competitor coatings. Contact angle measurements were proposed as quantitative method to prove the same.

**Samples evaluated** were 6 glass samples each coated with different hydrophobic coatings:

- Old
- New
- Competitor 1-4

**Measurements were done** using the Attension Theta Optical Tensiometer. Static contact angles were measured with 3 ul drops. For dynamic contact angle measurements with tilting cradle 10 ul drops were used.

### Measurements – Static contact angle

Static contact angle data is shown in **Table 1**. Although, the new coating has the highest static contact angle value, this data alone is not able to prove the superiority of the new coating. The difference between the new and the old coating values is too minor to draw any conclusions one way or the other. Also, the competitor coatings have static contact angles on a same range as the new coating.

Old	New	Competitor 1	Competitor 2	Competitor 3	Competitor 4
111	115	104	109	109	106

**Table 1:** Static contact angles for different coatings



**Measurements –  
Dynamic contact angle**

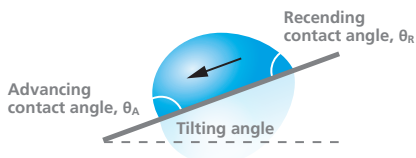
The dynamic contact angle data is shown in **Table 2**. Now a clear difference between the different surfaces can be seen. The contact angle hysteresis on the new coating is much lower when compared to both old and competitor samples. Roll-off angle is also able to show a clear difference between different samples.

	Old	New	Competitor 1	Competitor 2	Competitor 3	Competitor 4
Advancing	122	119	112	120	119	112
Receding	97	112	94	104	96	93
Hysteresis	25	7	18	16	23	19
Roll-off angle	43	14	45	32	40	N.A.

**Table 2:** Dynamic contact angle on different coatings

**Conclusions**

Measuring only static contact angle was not sufficient to show clear differences in between the coatings. However, the dynamic contact angle measurements were able to distinguish the changes in the coating properties. Low roll-off angles are related to better cleanability. In this study, it was shown that the roll-off angle on new coating was significantly lower than on the other ones.



**Figure to the left:** Principle of dynamic contact angle measurement

**Figure below:** Example images of drops with different tilting angles (sample "old")

