



## Case Studies of UV-KLEEN using ATP Luminometer

During the pandemic, the industry developed many of its self-regulated standards for hygiene and cleanliness. ATP (Adenosine Triphosphate) measurement using Luminometer was a standard practice in food processing industries to measure its cleanliness. In recent times, ATP Luminometer is widely used in the hotel industry as well, to check whether the environment has been properly cleaned.

ATP is a molecule found in all living cells and it is responsible for transferring and storing energy. ATP levels act as an indicator of whether your environment has been properly cleaned. ATP Luminometer shows the results in RLU (Relative Light Unit). Higher the RLU the dirtier the surface is. EP Lighting Inc used industry-proven SystemSURE Plus™ Luminometer by Hygiena™ to measure ATP at its customer locations.

### Case Study 1: Commercial Office building with workstations.

EPL performed ATP testing at one of its customer locations in Salt Lake City, UT, USA. The facility is a manufacturing facility with people working on 36inch workbenches. The facility also has a warehouse to process, pack and store the product. Six measurement locations were chosen depending on their usages, exposure, and availability.

UV-KLEEN PRK unit is installed to disinfect the facility at the measured locations. The PRK unit is run for 5 min at most of the locations, except the potting tool located in the warehouse. The warehouse is an open floor plan with at least 1000 sqft, which required additional 10 more minutes of disinfection.

The ATP swab test results are measured before, and after applying the UV-KLEEN are listed below.

Location #	Initial RLU	5 MIN	15 MIN	Area of room	Location of PRK from testing area	Reduction in RLU	Notes
1) Bathroom light Switch	399	181		150 sqft	4ft	55%	Direct UV light shine + Ozone
2) Bathroom Toilet seat	253	101		150 sqft	4ft	60%	
3) Floor	4126	612		450 sqft	5ft	85%	
4) Work Bench 1 @ 36 in height	1682	971		450 sqft	6ft	42%	UV light is not shining on the surface. The disinfection is due to Ozone
5) Work Bench 2 @ 32 in height	550	240		450 sqft	6ft	56%	
6) Potting tool @ 36 in height	1186		246	OPEN SPACE	10ft	79%	

Table 1: Reduction in RLU at various locations in a Manufacturing facility using PRK unit

From Table 1, the measuring spots in locations 1, 2, and 3 are exposed to the UV light directly along with the Ozone. However, the measuring points in locations 4, 5, and 6 are chosen in such a way that the UV light from the PRK is not directly shining on, but the Ozone was directed using an additional fan.

The reduction in the RLU is calculated using, (Initial value- final value)/initial value. From table 1, except location 6; all other locations are measured after the 5min run of the PRK unit. Location 6 is a 1000sqft open space and does not have boundaries, hence 15 min run was conducted for better germicidal efficacy. The percentage reduction in the RLU, in other words, the percentage reduction in the organic material that helps the bacteria to grow at all locations is significantly reduced using the PRK unit. Appendix A lists all the relevant pictures of the locations.

## Case Study 2: Single-family house

The ATP measures are taken in an individual home using Hygiene™ Luminometer in Salt Lake City, USA. Enough data samples are taken that cover both the UV and UV+Ozone testing scenarios. Table 2 lists the detailed data measured after using PRK 300 unit.

Location #	Initial RLU	1 MIN	5 MIN	Area of room	Location of PRK from testing area	Reduction in RLU	Notes
1) Living room Sofa Arm Rest	2975		650	850 sqft	6ft	78%	UV Only, No Ozone
2) Light Switch	1469		808		5ft	45%	Direct UV light shine + Ozone
3) Living Room Floor	705		250	850 sqft	2ft	65%	
4) Bathroom Shower Door Knob	180	115		220 sqft	4ft	36%	UV light is not shining on the surface. The disinfection is due to Ozone
5) Bathroom Door Knob	160	97		220 sqft	4ft	39%	
6) Chair Arm Rest	682		473		3 ft	31%	
7) Treadmill - hidden spot	330		156		6ft	53%	
8) Work Bench @ 36 in Garage	1273		754	170 sqft	6ft	41%	
9) Office Room @ 48in Raised Desk	1049		629	170 sqft	6ft	40%	
10) Office Room @ 32in desk	47		9	170 sqft	6ft	81%	

Table 2: Reduction in RLU at various locations in a single family home using PRK300 unit

From Table 2, it is evident that the PRK series significantly reduced the RLU count of the ATP, resulting in a significant reduction of the organic material that helps the bacteria to grow.

In addition to the PRK unit, EPL used its proprietary HWK 40 (HandWandKleen 40w) to measure its germicidal efficacy. Table 3 shows the detailed data using HWK40 at measuring locations inside the house. The HWK40 uses a 40W Non-Ozone UV lamp. The germicidal efficacy of the HWK series is UV only. The HWK40 unit is held 6 inches away from the affected area to measure the RLU.

Location #	Initial RLU	3 sec (6-8 inch)		6 sec (6-8 inch)		10 sec (6-8 inch)		15 sec (6-8 inch)	
		After RLU	%ge reduction	After RLU	%ge reduction	After RLU	%ge reduction	After RLU	%ge reduction
1) Office Desk	3863	1022	74%	806	79%				
2) Key board	942			632	33%				
3) Dining table	3285					2600	21%	1535	53%

Table 3: RLU reduction using HWK40 (HandWandKleen 40w) in a single family house

From Table3, it is seen that the RLU is reduced further after prolonged exposure of the HWK40 to the surface. A 6-second exposure of HWK40 increased germicidal efficacy of the unit by 5% (74% o 79%) when compared to 3-second operations.

### Case Study 3: Restaurant

PRK300 series is used to disinfect surfaces and air at a restaurant in Salt Lake City, Utah. The Hygiene™ Lumenometer is used to measure the RLU of ATP, the organic material causing the bacteria to grow on the surface and air.

Table 4 shows the data collected at various measurement points in the restaurant.

Location #	Initial RLU	5 MIN	10 MIN	Area of room	Location of PRK from testing area	Reduction in RLU	Notes
1) DiningAreaCashRegister	998	406		600 sqft	5ft	59%	Hidden spot, UV + Ozone
2) MainCashRegister	771	530		30ft long	9ft	31%	
3) TouchScreenModule	735	420		600 sqft	9ft	43%	
4) KitchenGriddle	1572	1110		500 sqft	5ft	29%	PRK on ground
			420		Elevated	73%	PRK elevated to Griddle height
5) DiningAreaFloor	3245	2739		Open Space	1ft	16%	Possible error with the data
			110			97%	

Table 4: Reduction in RLU at a restaurant using PRK300

Note: The griddle height was approximately 32 inches from the ground. Due to the size and shape of the kitchen area, the PRK's UV light was never shining on the griddle surface. At the time of testing, the air circulation of the restaurant was extremely limited, causing the Ozone to settle on the ground, and never spread across the griddle. After 5 minutes of testing, the PRK was lifted high to the level of Griddle for better disinfection rates. Appendix C shows the picture of elevated PRK in the kitchen.

Note: The restaurant was wiped clean before the EPL testing and the initial RLU was measured low compared to any other traditional restaurant environment. Typical restaurant initial values are at least 3-4 times more than the above values.

**Conclusion:** ATP meter is widely used in the hotel, restaurant, travel industries to check the cleanliness of the facility. The above three case studies shows that UV-KLEEN is effective against cleaning surfaces and air in different locations. Hidden spots and hard to reach areas are successfully disinfected using the Ozone feature of the UV-KLEEN. The direct to hit UV areas are proven to be extremely effective in eliminating the pathogens. Therefore, for efficient operation, it is highly recommended to use both the UV and Ozone features of the UV-KLEEN. If you have any questions about this report, please contact us at [info@uvkleen.us](mailto:info@uvkleen.us) or [info@eplightinc.com](mailto:info@eplightinc.com)

Appendix A: Pictures for Case Study 1 (Manufacturing Facility)



Appendix B: Pictures for Case Study 2 (Single family House)



Appendix C: Pictures for Case Study 3 (Restaurant)





Main Cash Register



Elevated Unit Kitchen



Dining Room Floor



Dining Room Floor