

Technical Service Bulletin



GURTLEA
INDUSTRIES, INC.

Using Pulse Shield to Meet Shortage Demands for Personal Protective Equipment (PPE)

Background

Beginning in Wuhan China in December 2019 and spreading into a global pandemic extending past April 2020, the Coronavirus known as "Covid-19" has resulted in enormous numbers of stricken persons requiring hospitalization. The unforeseen, and unprepared for, pandemic and resulting needs for healthcare have strained the healthcare community to a point where there is a significant shortage of Personnel Protective Equipment (PPE) including but not limited to: Face Masks, Isolation Gowns, Gloves, Face Shield and other; along with hand sanitizers and hard surface disinfectants. With many of those stricken by the virus requiring hospitalization, and those who are admitted to the hospital being placed into either Isolation or Intensive Care; the demands for PPE are significant. These demands, when coupled with global shortages due to shuttered textile production facilities, and travel /shipping restrictions have created a dire situation where alternative means of producing/procuring healthcare supply items have been granted under emergency Presidential/Governmental order.

A general lack of disposable Isolation gowns and protective coverings which can be worn by healthcare providers has prompted some to ask if existing healthcare textiles can be repurposed into protective coverings. To meet this need, Gurtler conducted an impact assessment as to application of the protective laundry aide Pulse Shield on an assortment of typical healthcare textiles. The following research study summation illustrates how Pulse Shield can be applied to common healthcare wear with the generation of enhanced fluid repellent properties attained.

Application of Pulse Shield

Using an existing stock of "in-service" healthcare textiles which have been collected into Gurtler's textile inventory, five (5) classifications of healthcare textile items were collected for study. These healthcare textiles included:

- New 100 % polyester scrubs
- In-service 100% polyester scrubs
- In-service blended cotton/polyester scrubs
- In-service blended cotton/polyester patient gowns
- In-Service 100% Polyester Laboratory Coat

All textiles were laundered and treated in the Gurtler Milnor Washer/Extractor. The wash process and Pulse Shield treatment are outlined in Table 1.

Table 1) Repurposing Healthcare Textiles with Pulse Shield

Operation	Time (minutes)	Temperature	Chemistry (per cwt.)	Active Alkalinity	Available Oxygen	pH
Break	8	140-150	12oz Power Jolt, 6oz Power Block, 6oz Power Blast	10 drops (440ppm)		
Bleach	8	160	8oz Hydrogen Peroxide			
Rinse	2				11 drops (121ppm)	
Rinse	2	145				
Rinse	2	130				
Sour (set-up)	1	115	6oz Sour Plus			5.0
Pulse Shield	10	100	32oz Pulse Shield			5.0
Extract-low	3	275 rpm				

Dry Conditions: Dry garments to full-dry based on fiber/fabric composition. Typically this is a high-heat setting. Extending the dry cycle will aide in developing the full-cure of the Pulse Shield to the fabric.

Performance Evaluations:

The efficacy of the application of Pulse Shield to normal daily healthcare wear was measured via the following test methods:

AATCC Method 79: Absorbency of Textiles

AATCC Method 118: Oil Repellency: Hydrocarbon Resistance Test

AATCC Method 193: Aqueous Liquid Repellency: Water/Alcohol Solution Resistance Test

Impact of Repeated Laundering & Treatment Cycles:

Each of the above textile classifications were repeat laundered for several wash-and-dry cycles. The tables below display the test solutions from each AATCC test method that were used to evaluate the textiles for repellency.

AATCC Method 193: Aqueous Liquid Repellency: Water/Alcohol Solution Resistance Test

Test Liquid	Water/Alcohol Ratio
W	100% water
1	98/2
2	95/5
3	90/10
4	80/20
5	70/30
6	60/40
7	50/50
8	40/60

AATCC Method 118: Oil Repellency: Hydrocarbon Resistance Test

AATCC Oil Repellency Grade Number	Composition
1	Kaydol (Mineral Oil)
2	65:35 Kaydol: n-hexadecane
3	n-hexadecane
4	n-tetradecane
5	n-dodecane
6	n-decane

Results of Repetitive Laundering & After-Treatment

The Pulse Shield treatment of 32oz/cwt was applied to every cycle beginning with the initial treatment and continuing through the following wash & treatment cycles as seen in the tables below.

New 100% Polyester New Scrubs

	Water-Drop AATCC Method 79	Water/Alcohol AATCC Method 193	Hydrocarbon Oil AATCC Method 118
Prior to Re-purposing:	Fail: Not Water Repellent	Fail at 1 (98% water/2% Isopropyl)	Fail at 1 (Kaydol)
After 3 Cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 6 (n-decane)
After 10 cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 6 (n-decane)
After 20 cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 6 (n-decane)

New 100% Polyester In-Service Scrubs

	Water-Drop AATCC Method 79	Water/Alcohol AATCC Method 193	Hydrocarbon Oil AATCC Method 118
Prior to Re-purposing:	Fail: Not Water Repellent	Fail at 1 (98% water/2% Isopropyl)	Fail at 1 (Kaydol)
After 3 Cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 6 (n-decane)
After 10 cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 6 (n-decane)
After 20 cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 6 (n-decane)

Laboratory Coat

	Water-Drop AATCC Method 79	Water/Alcohol AATCC Method 193	Hydrocarbon Oil AATCC Method 118
Prior to Re-purposing:	Fail: Not Water Repellent	Fail at 1 (98% water/2% Isopropyl)	Fail at 1 (Kaydol)
After 3 Cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 6 (n-decane)
After 10 cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 6 (n-decane)
After 20 cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 6 (n-decane)

In-service blended 65% cotton/ 35%polyester scrubs

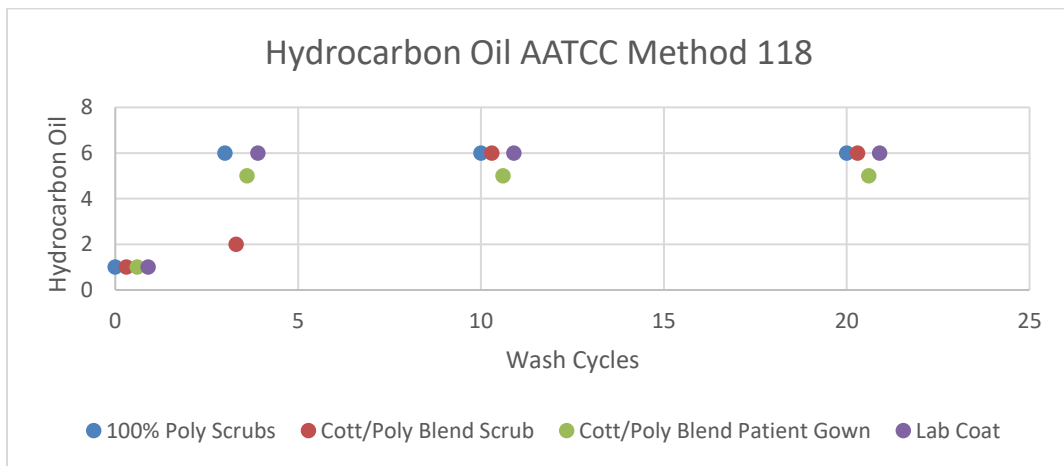
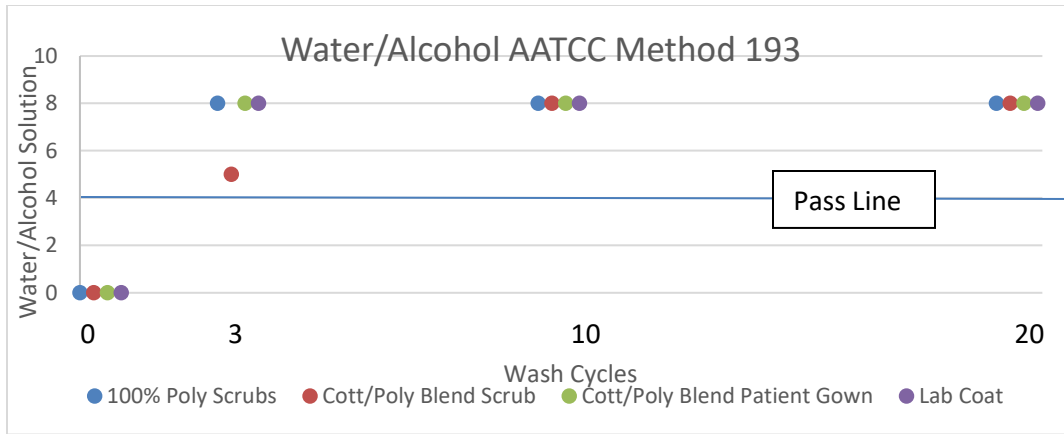
	Water-Drop AATCC Method 79	Water/Alcohol AATCC Method 193	Hydrocarbon Oil AATCC Method 118
Prior to Re-purposing:	Fail: Not Water Repellent	Fail at 1 (98% water/2% Isopropyl)	Fail at 1 (Kaydol)
After 3 Cycles of 32oz/cwt	Pass: Water Repellent	Pass at 5 (water repellent 70%water/30% Isopropyl)	Pass at 2 (65:35 Kaydol:n-hexadecane)
After 10 cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 6 (n-decane)
After 20 cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 6 (n-decane)

In-service blended 55% cotton/ 45%polyester patient gowns

	Water-Drop AATCC Method 79	Water/Alcohol AATCC Method 193	Hydrocarbon Oil AATCC Method 118
Prior to Re-purposing:	Fail: Not Water Repellent	Fail at 1 (98% water/2% Isopropyl)	Fail at 1 (Kaydol)
After 3 Cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 5 (n-dodecane)
After 10 cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 5 (n-dodecane)
After 20 cycles of 32oz/cwt	Pass: Water Repellent	Pass at 8 (water repellent 40%water/60% Isopropyl)	Pass at 5 (n-dodecane)

The results of the Pulse Shield application study reveal that multiple healthcare textiles that are normally water and oil absorbent, can be made into oil and water repellent after they are treated with 32oz/cwt of Pulse Shield. After three (3) wash cycles of 32oz/cwt of Pulse Shield being added to the Sour bath, all five textile classifications displayed dramatic increase in water and oil repellency. After three wash cycles of 32oz/cwt of Pulse Shield, textiles had the ability to go from instantly absorbing water and oil to showing a sustainable water repellency of 40% water/ 60% Isopropyl , and a sustainable oil repellency of n-decane.

The graphs seen below depict the results of the evaluation for both AATCC Method 193 and AATCC Method 118 after wash cycles three, ten, and twenty. From the graphs, it is evident that after the three consecutive washes with Pulse Shield, textiles went from having an instant water and oil absorbency to having a high water and oil repellency.



Conclusion

This study has illustrated that normal healthcare textiles can be enhanced in their fluid repellent properties, in an effort to meet the shortages of PPE attributed to the Covid-19 pandemic. Through the data collected, garments treated with a dosage of Pulse Shield at 32oz/cwt show significantly enhanced repellency, and after three washes, textiles that were previously water and oil absorbent have the ability to become water and oil repellent.

Cotton/Polyester blend patient gowns were also treated with a lower dosage of Pulse Shield (4oz/cwt, & 6oz/cwt), which was proven to be ineffective at displaying the desired degree of water and oil repellency that would be needed for a repurposed healthcare textile. The exact “maintenance dose” required during subsequent laundering cycles would need to be determined based on fabric composition.

It will be noted that these textiles were not tested against AAMI Standards, nor was a spray impact study of the treated garments conducted.

Ref: Strategies to Optimize the Supply of PPE and Equipment. (2020). *Coronavirus Disease 2019 (COVID-19)*, 1–2. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html>