CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2016
DateRun:	11/17/2016
Experimenters:	Nicholas Landberg, Carla De La Cruz, Alicia McCarthy
ClientType:	
ProjectNumber:	Project #1
Substrates:	Plastic
PartType:	Coupon
Contaminants:	Dirt, Films, Clay, Salts, Calcium/lime
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Visual
Purpose:	To identify the best cleaning product for removing mud stains from golf balls.
Experimental Procedure:	Dirty golf balls were selected, one for each cleaner to be analyzed. The balls were photographed and dirty weights were taken. Solution's dilutions were then prepared, and balls were immersed in the cleaner. Observations were taken every ten minutes, until 30 minutes. At the 30-minute mark the balls were then allowed to sit in solution for thirty minutes at a time, between observations. Further testing resulted in heating the solutions to about 60°C and allowing them to be immersed for about 10 minutes, then 20 minutes, and finally 30 minutes. Observations were made and photographs and final weights were taken. Additionally, the Envirox Har Water and Soap Scum Remover was retested on a different set of dirty golf balls, in order to confirm the efficiency of the product on the hardest to remove dirt. Using the above mentioned heated and timing conditions.
Results:	The initial testing in which the golf balls were immersed at room temperature showed that the Hard Water and Soap Scum Remover performed best. After 90 minutes the golf ball assigned to the Envirox cleaner was 100% clean. Additional testing introduced heating to about 60˚C, which caused the degradation of every golf ball due to the high heat. In 10 minute intervals totaling 20 minutes the golf balls experienced some change but the golf ball cleaned with the Hard Water and Soap Scum Remover was still the cleanest with no significant spots of mud. Further testing sought to confirm the efficacy of the Envirox cleaner by using some golf balls with hard to remove dirt. Many of the balls were significantly whiter, as much of the surface dirt was removed, but still remained less than perfectly clean. These golf balls were especially selected because of their stuck-on dirt.

Cleaner	Observations
Hard Water and Soap Scum Remover	RT: Solution cloudy initially. Dirt was dissolving appeared 80% clean within 1 hour. 100% clean within 90 minutes.
	Heated: Solution turned clear with layer of white cloudy film on surface
Neutral Floor Cleaner	RT: No visual change within 1 hour. But dirt comes off when wiped.
	Heated: Solution turned cloudy. Stubborn spots.
Purple Tiger [3]	RT: Clear solution with no dirt removal after 90 minutes.
	Heated: Solution turned cloudy. Spots of dirt left behind.
Purple Tiger [3.25]	RT: Solution is clear. Ball is still very dirty after 90 minutes.
	Heated: Solution turned cloudy. Some stuck-on dirt.
Purple Tiger [3C]	RT: Clear solution. No change to ball.
	Heated: Some spots persistent.
PC-120	RT: Clear solution no dirt removed.
	Heated: Golf ball still appears discolored; not white.

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BJS-I & MSI	RT: Clear solution with dirt floating at the bottom. Ball still dirty.
	Heated: Spots of dirt persistent.
Bio Circle Aero	RT: Solution initially cloudy. Small particles of dirt suspended in solution.
	Heated: Spots of dirt still persist.

Table 2. Golf balls cleaned with just Hard Water/ Soap Scum Remover

Cleaner	Observations
Hard Water and Soap Scum Remover	Heated 60˚C -
	Ball 1: Peeling visible within 10 minutes. Residue on ball. Cleaner after 10 minutes. Noticeably whiter after 1 hour. Close to completely clean after 90 minutes.
	Ball 2: Some dirt removed after 10 minutes. Not as much residue as other balls. Scratched on dirt persistent. Visibly whiter after 1 hour. Stubborn spots left after 2 hours.
	Ball 3: Some color change toward white within 10 minutes. No residue. Visibly cleaner after 1 hour. Clear change from beginning after 2 hours.
	Ball 4: Some removal at 10 minutes and residue. Almost completely clean at 1 hour. Only stubborn spots remained.
	Ball 5: Some dirt removal and color change toward white within 10 minutes. Significantly clean after 1 hour. Almost clean at 90 minutes. Some stubborn spots left after 2 hours.

Summary:

Substrates:	Plastic				
Contaminants:	Dirt, Films, Clay, Salts, Calcium/lime				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
EnvirOx LLC	EnvirOx Hard Water Cleaner	100	0.00	☑	Almost completely clean at room temperature
ZEP Manufacturing Company	Neutral Floor Cleaner Concentrate	5	0.00	☑	Persistent spots of dirt remained
Chemco	Purple Tiger All purpose cleaner	100	0.00	☑	Persistent spots of dirt remained
Next-Gen Supply Group	PC 220 Peroxide Multipurpose Cleaner	5	0.00	☐	very discolored, not white like the rest
Vitech International inc.	BJS-1 Acid Replacement	10	0.00	☑	Persistent spots of dirt remained
J Walter Inc.	Bio Circle Aero	100	0.00	☑	Persistent spots of dirt remained

Conclusion:

After 2 hours of heated immersion the Hard Water and Soap Scum Remover could not get rid of these stubborn spots. It would seem that the cleaner works best on surface dirt, as opposed to stuck-on dirt, but it will result in noticeably whiter golf balls.