Kimetsan Aerospace and Defence Coatings Ltd

“Pulling Performance and Pollution Prevention Together”

2006 International Workshop on Pollution Prevention and Sustainable Development

Colorado Springs USA

While Confronting Climate Change is an Increasingly Important Issue -

It does not have to be -

At The Expense of The Economy

Alternative Coating Solutions can Preserve

and Enable Business to Grow

With minimal Environmental Confrontation

Pollution Prevention Initiatives

Reduce the VOC content of Coatings, Coating Removers and Cleaners

Lower the S/G of Coatings - Adopt nano technology

Lower the Application Pressure and Improve Transfer Efficiency

Reduce the Dry Film Thickness by increasing the Performance

Eliminate Heavy Metals, Toxic and Carcinogenic Chemicals

Kimetsan Waterborne Technology

True Waterborne Coating Systems:

- D45 AMS Series, D70 AMS & D100 AMS
- AMS Coating Removal System, Universal Coating Removal System,
- Surface Preparation Solution
- All Low or Zero VOC, No HAPS, POPS & Non Toxic
- Designed to Replace Organic based Products

Kimetsan D-AMS Series

"Leading the way in Waterborne Performance"

- Conductive Coating
- First WB Clear Coat <90g/litre VOC
- Rain Erosion Resistant Coating (RERC)
- First WB White / Clear Coat Combination >90% Gloss @ 60°
- Light Weight, All Weather, Radar Absorbing Coating (RAC)

- Skydrol Resistant
- Hydrolytic Stability
- Adhesion Performance
- Resistant to chemical and mechanical abuse

D45-AMS Series Pollution Prevention Solutions

All Nano Technology

VOCs <60g/l (Clear coat <90g/l).

Achievable Transfer Efficiency >95%

Recommended application pressure 2 - 7psi

Recommended DFT >50% less than High Solid Coatings

Antistatic, Anti graffiti, Hydrophilic, Low Maintenance

Eliminates VOCs from Thinners, Substrate Cleaning and Wash up.

SCAQMAD (Aerospace*) Rule 1124

Examples.

Coating	VOC	D45 AMS	Δ%VOC
CARC	220g/litre	<60g/l	320%
Low IR	340g/litre	<60g/l	560%
Primer	350g/litre	<60g/l	580%
Top Coat	420g/litre	<60g/l	720%
Clear Coat	520g/litre	<90g/l	860%
RAC	600g/litre	<60g/l	1080%
RERC	800g/litre	<60g/l	1480%
Conductive	1000g/litre	<60g/l	1880%

*Aerospace Assembly and Component Manufacturing Operations.

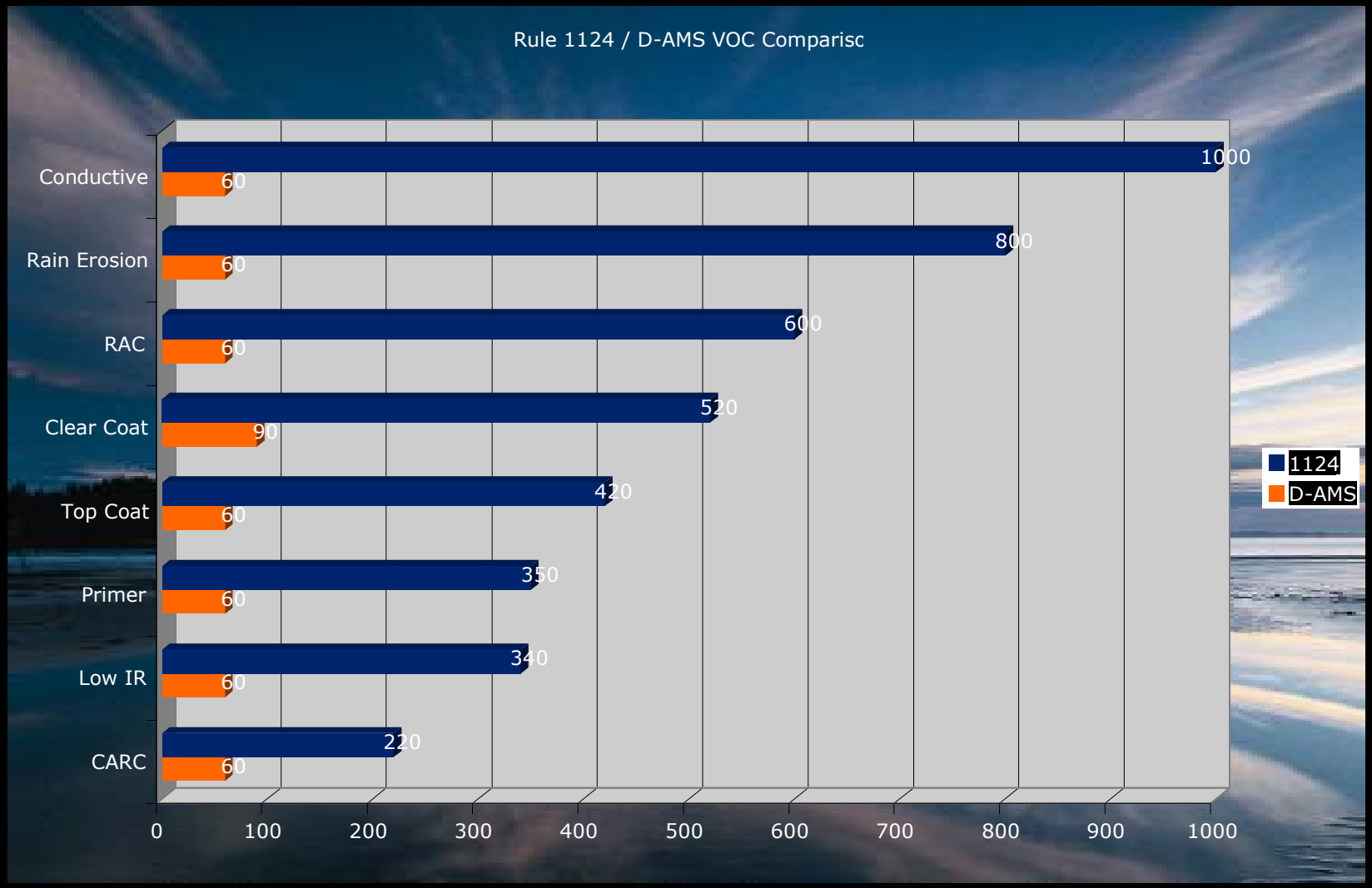
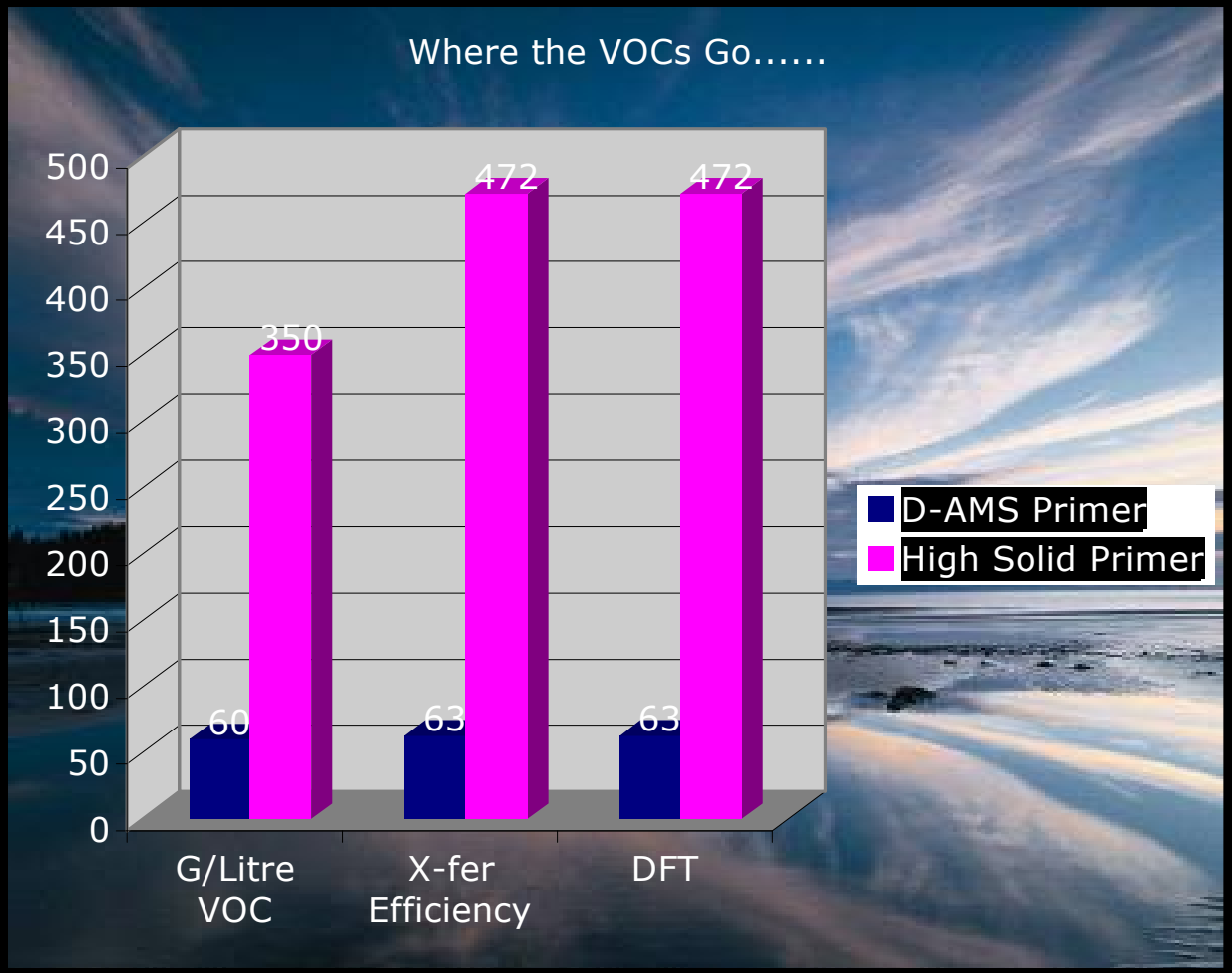
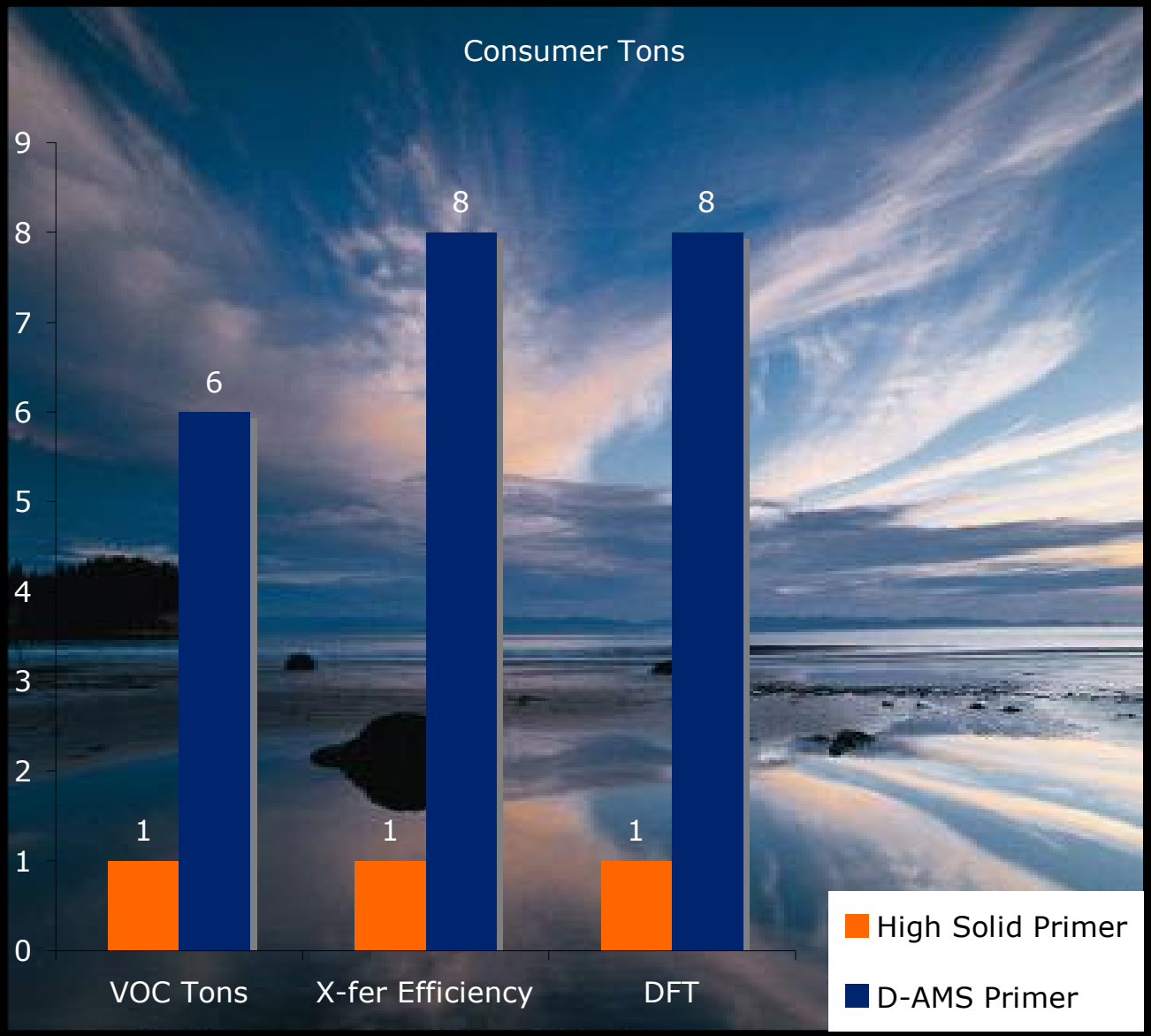

Rule 1124 / D-AMS VOC Comparisc
Conductive
Rain Erosion
RAC
Clear Coat
Top Coat
Primer
Low IR
CARC
1000
60
800
60
600
60
520
90
420
60
350
60
340
60
220
60
0
100
200
300
400
500
600
700
800
900
1000
1124
D-AMS

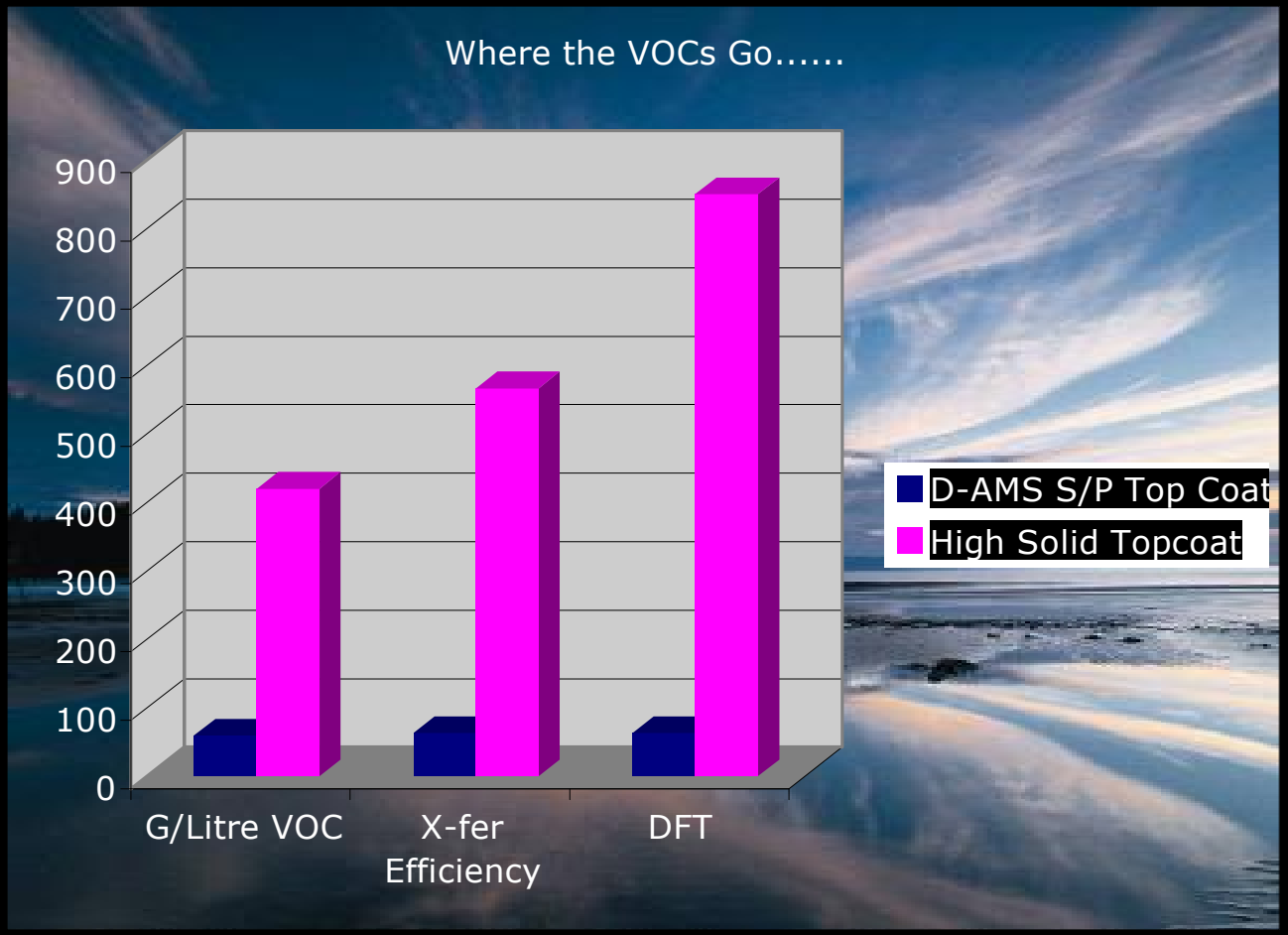
Chart Legend

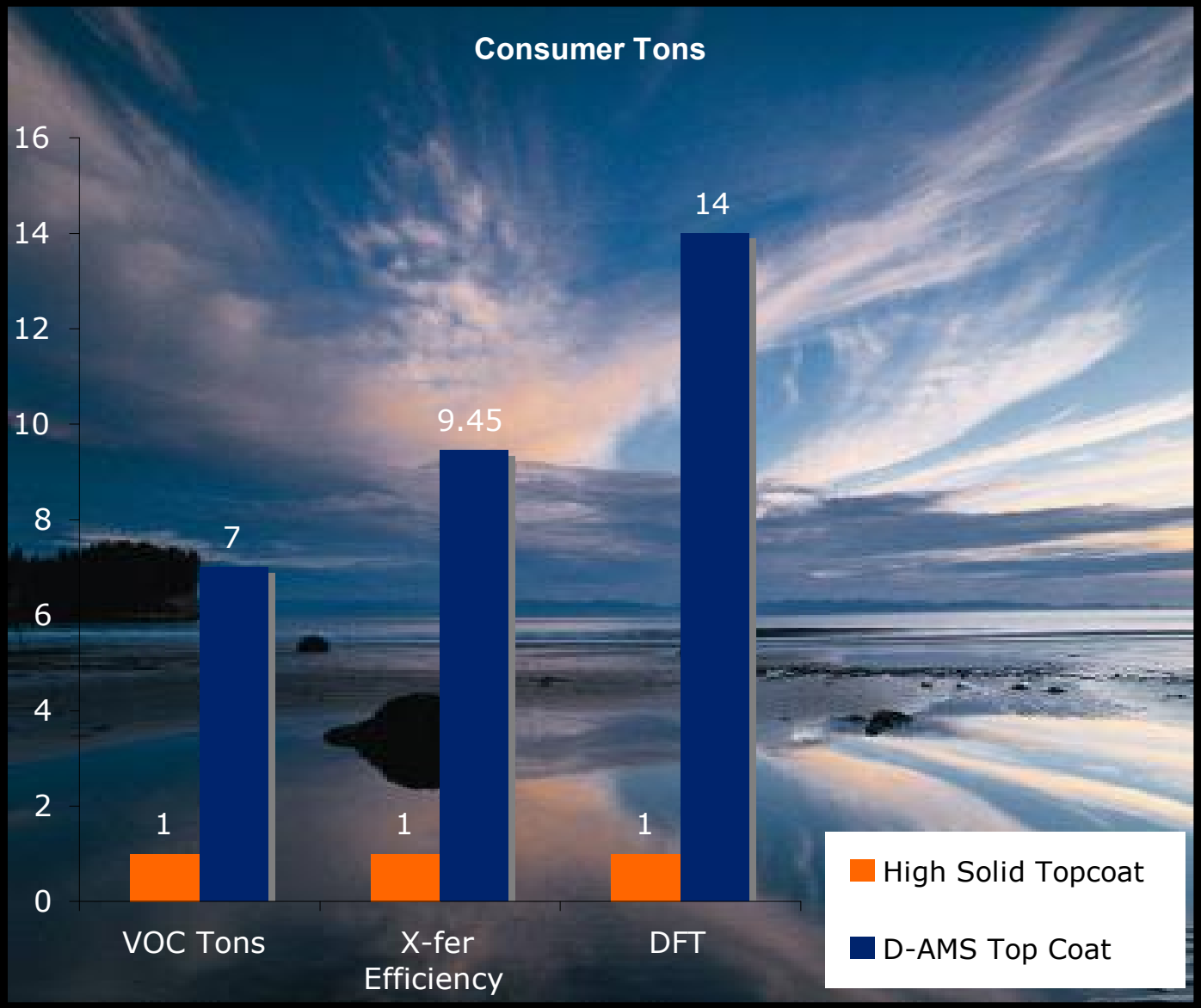
35% Improved Transfer Efficiency (35% less overspray).

50% Less Top Coat Product (50% lower Dry Film Thickness)


Where the VOCs Go……
500
450
400
350
300
250
200
150
100
50
0
350
472
472
60
63
63
G/Litre VOC
X-fer Efficiency
DFT
D-AMS Primer
High Solid Primer


Consumer Tons
9
8
7
6
5
4
3
2
1
0
1
6
1
8
1
8
VOC Tons
X-fer Efficiency
DFT
High Solid Primer
D-AMS Primer


Where the VOCs Go……
900
800
700
600
500
400
300
200
100
0
G/Litre VOC
X-fer Efficiency
DFT
D-AMS S/P Top Coat
High Solid Topcoat


Consumer Tons
16
14
12
10
8
6
4
2
0
1
7
1
9.45
1
14
VOC Tons
X-fer Efficiency
DFT
High Solid Topcoat
D-AMS Top Coat

EU Council Directive 1999/13/EC

Effective: November 1st. 2007.

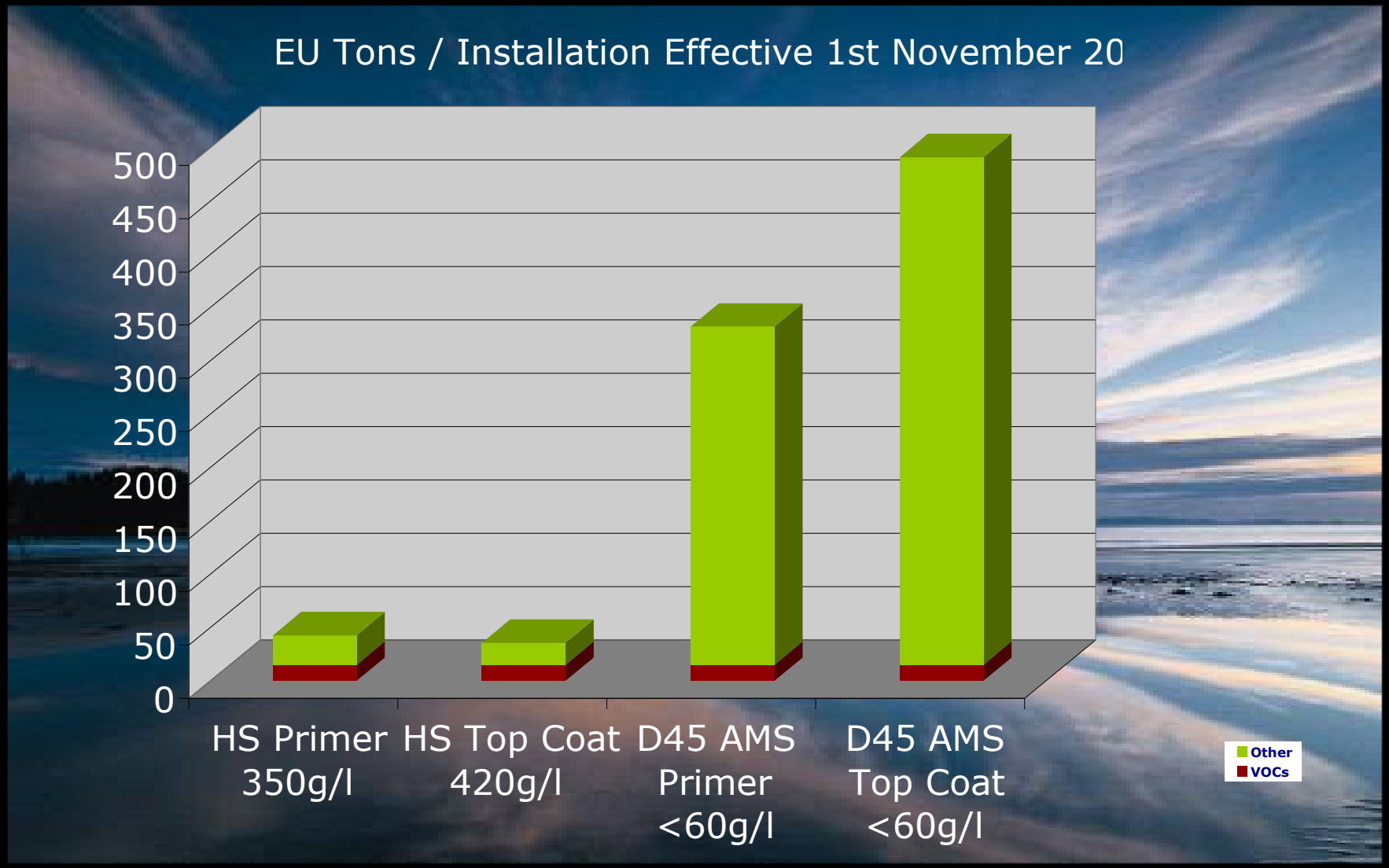
Coating Activities at any one installation:

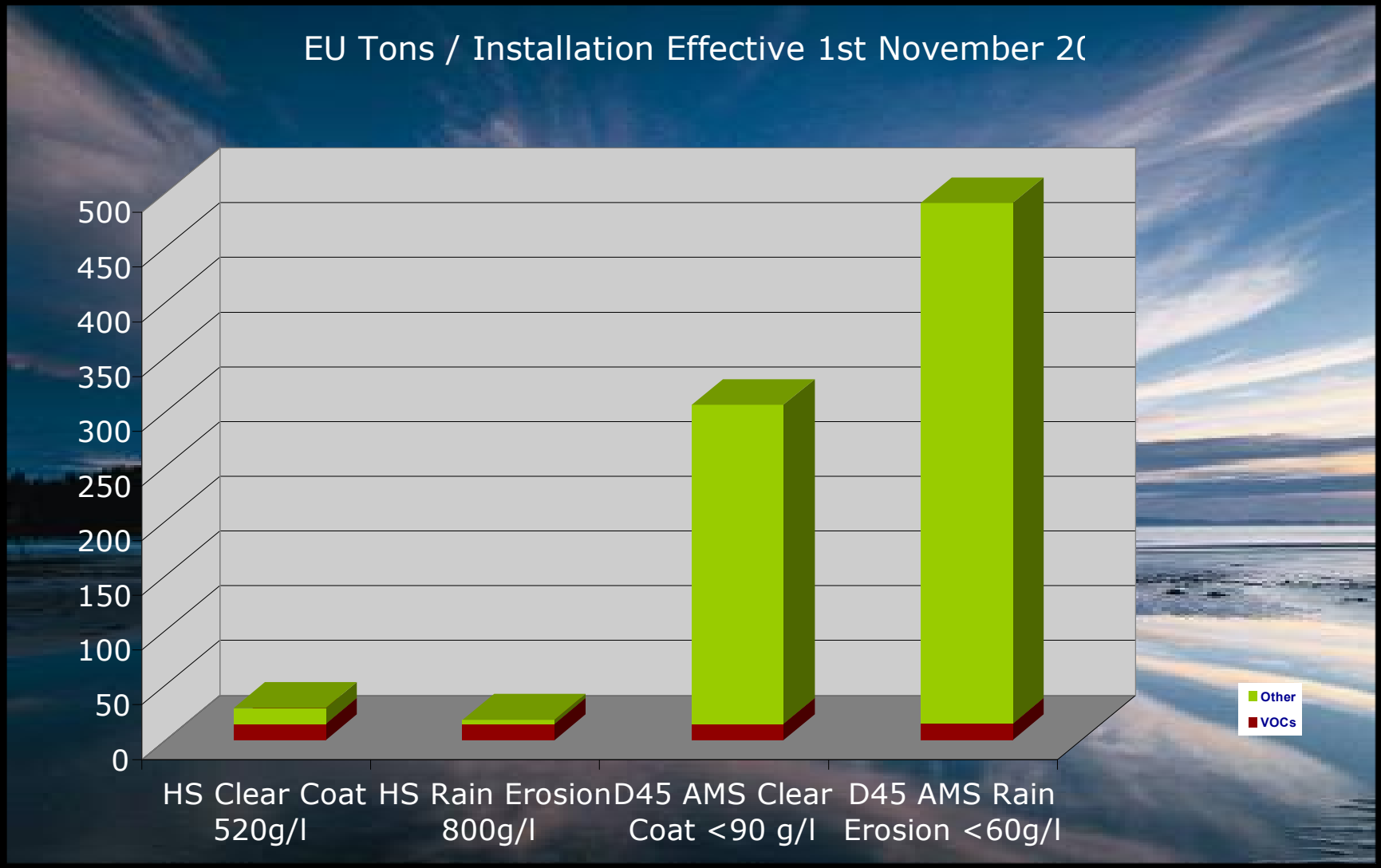
VOC (Solvent consumption) threshold limited to 15 tons/year.

Annex 1 Scope: Applicable to Coating Applications on Metallic and Plastic surfaces of Airplanes, Ships, Trains, etc.,

EU VOC Emission Rules

- EU. Controls apply to individual installations (plants)
- EU. Each plant has to conform to the applicable VOC:Solids ratio for their industry, e.g. Aerospace.
- EU. The VOC:Solids ratio is factored for the industry using the multiplier in Annex 11B of the Directive.
- EU. The Aerospace multiplication factor is 2.33.
- EU The multiplication factor for other coatings is 1.5.
- EU. The multiplication factor is applied to the Solids.
- EU. Interpretation of Solids is the Dry Film (after the solvents and water have evaporated).
- EU. The VOC:Solids ratio is an average of all materials.
- EU. The materials include: Coating solvents, thinners and solvents to clean up equipment. (Pre painting cleaning solvents are covered by another Directive).


EU Tons / Installation Effective 1st November 20
500
450
400
350
300
250
200
150
100
50
0
HS Primer 350g/l
HS Top Coat 420g/l
D45 AMS Primer <60g/l
D45 AMS Top Coat <60g/l
Other
VOCs


EU Tons / Installation Effective 1st November 2(
500
450
400
350
300
250
200
150
100
50
0
HS Clear Coat 520g/l
HS Rain Erosion 800g/l
D45 AMS Clear Coat <90 g/l
D45 AMS Rain Erosion <60g/l
Other
VOCs

A Practical Application

B 757

HS Average 4.5* mils External* DFT / 108.4kgs

D45 AMS Series Average 2.5 mils External* DFT / 60.2kgs.

Difference: 48.2kgs

B 777

HS Average 4.5* mils External* DFT / 215.5kgs

D45 AMS Series Average 2.5 mils External* DFT / 120kgs

Difference: 95.5kgs

Fuel Burn B 757: 3.5kg Fuel / Hour / Every additional 100Kg Paint carried.

Fuel Burn B 777: 6kg Fuel/ Hour / Every additional 100 kg Paint carried.

B 757 Saves 1 Ton Fuel Burn / 285hr (16 Tons/pa) with D45 AMS Series

B 777 Saves 1 Ton Fuel Burn / 166hr (30 Tons/pa) with D45 AMS Series

*DFT and Upper/lower fuselage, Tail and Customer Markings. (Source Boeing)

Additional Fuel Burn Considerations

- **Jet Soot & Grime Create Drag = Fuel Burn**

  Solution: D45-AMS Series

- Easy To Clean
- Anti Static
- Hydrophilic

- **Poor Laminar Flow Creates Drag = More Fuel Burn**

  Solution: D45-AMS Series

- Thin DFT Δ Between Applied Color Livery
- Does not easily Chip or Crack causing local areas of turbulence

advanced research environmental atomization

Using Dux Technology with AMS Coatings

Spray gun Set-ups:

Dux Gravity Gun

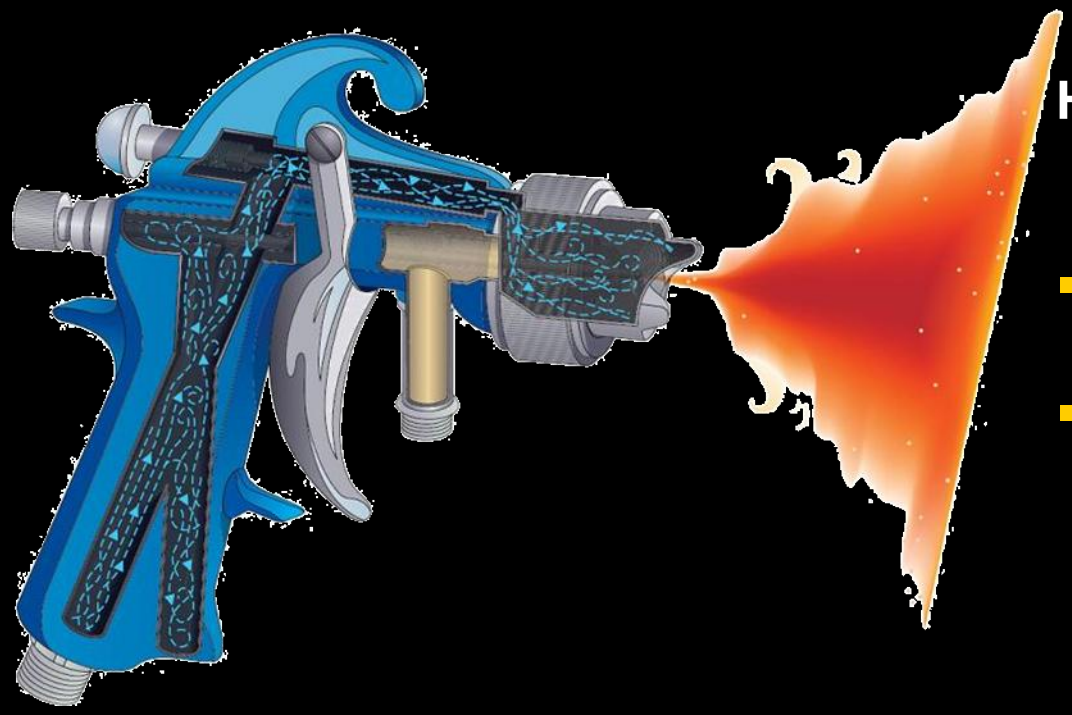
Nozzle	1.2mm
Air cap	A1
Fan Pattern	2”– 9”
Air Pressure	2-7psi

Dux Pressure Feed

Nozzle	1.0mm
Air cap	AO
Fan Pattern	2”-14”
Air pressure	2-7psi

Do NOT be apply below 10° C / 50° F

Normal HVLP Spraygun and Atomisation Method



Typical HVLP Design

High internal pressures cause "explosion" at air cap

- Air blown out of spray column
- Coatings particles carried away with air, creating booth "fog"

Higher air pressures required

- 25-40psi at the gun inlet to produce 10psi at Air Cap
- Loss inside the gun is 15-30psi

Turbulence inside gun also creates static charge

- Coating particles repel one another forcing some out of column
- Contaminants with opposite charge are drawn into coating

The DUX gun is different

Straight passages & sweeping curves

- Reduce friction and turbulence

Fewer obstructions

- fluid needles, springs, and other parts separated from air flow passages

Minimized air travel distance

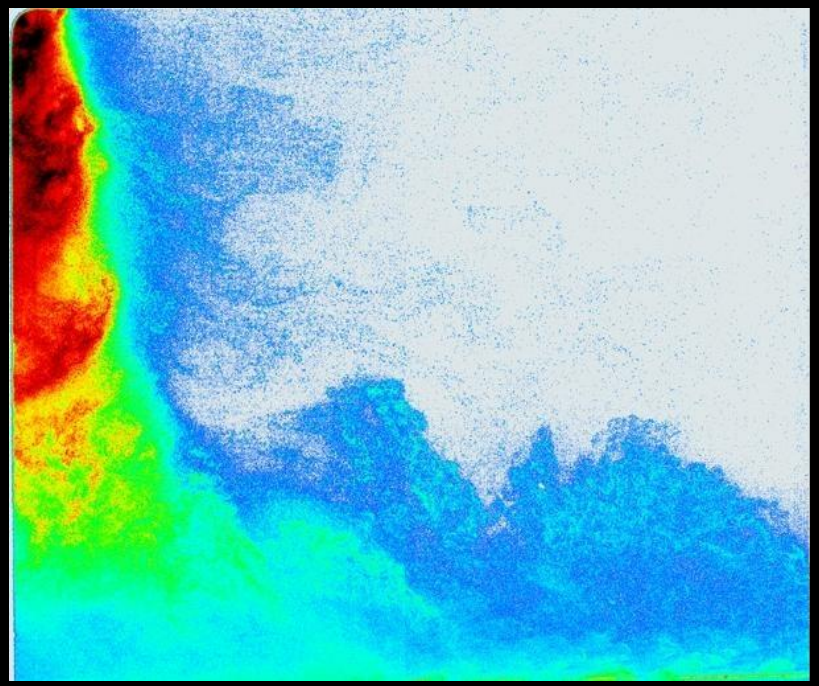
- Less wall friction = lower pressure

Less air expansion at air cap

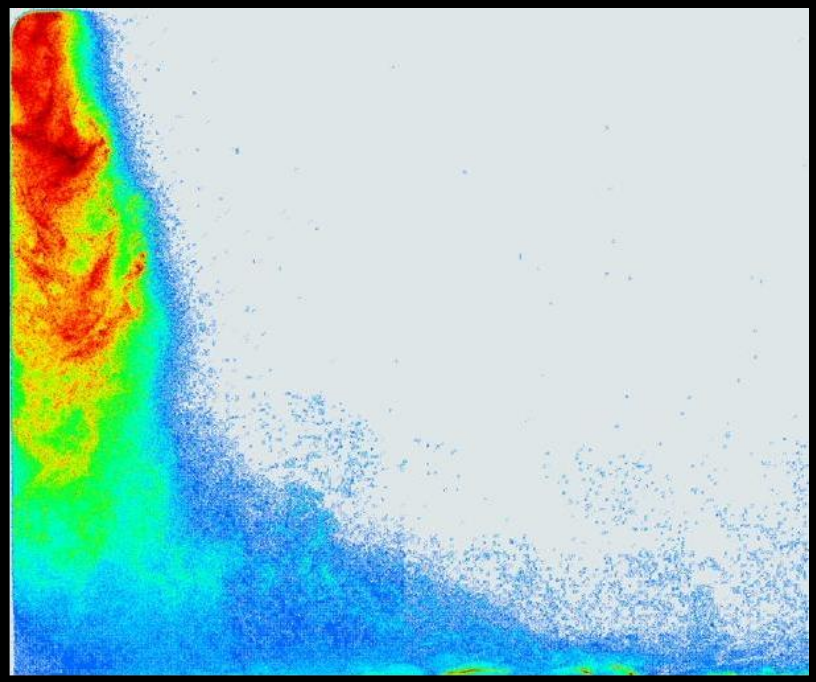
- lower operating pressures result in less explosive effect

Seeing the difference

Particle Image Velocimetry (PIV) Imagery



Typical HVLP Spray Gun



The DUX Spray Gun

(Both spray guns operated at 10psi air pressure at the air cap)

Using Dux Technology with AMS Coatings

"The Unique DUX Laminar Flow Atomisation of AMS Series Coatings, enables a Finish, Unmatched by other guns at these Extremely Low Pressures".

advanced research environmental atomization

Using Dux Technology with AMS Coatings

“UP to a 14” Fan and Over 90% Gloss Finish can be Achieved with Ease -

- Provided the Recommended Application at 2 - 7psi is adhered to”.

Pollution Prevention Beyond VOCs.

1. Elimination of Chromates in Primer Coatings — Various
   Projects In Progress (August 2006).

2. Alternatives to Aliphatic Isocyanate Urethanes — NASA AFSPC
   Project in Phase II Testing (August 2006)

3. Elimination of Toxic Materials from RAC. — Kimetsan / NATO
   Environmental Project Complete.

   Performance evaluation on going.

Overall Advantages

- Free of Components listed under EPA-17.
- Reduces the need to Develop and Implement Environmental Strategies, Administer Safety Programs, Emergency Prevention, Preparedness and Response.
- Eliminates the additional cost of transporting Hazardous Materials.
- Reduces the Cost of Maintaining related Environmental Permits, Record Keeping, Inspections and Reporting Thresholds defined by:
- California Proposition 65, EPA TSCA; OSHA PEL; SARA Sections 302 & 313 SARA III and EPA Genetic Toxicology Program in the USA.
- REACH (Registration, Evaluation, Authorization of Chemicals) in Europe.

Kimetsan Aerospace and Defence Coatings Ltd

Environmental Coating Solutions