NSRP Presentation *Bilge Corrosion & Coating Maintenance*
Reduction of Total Ownership Costs

Richard Parks, Consultant to Sulzer Mixpac USA.

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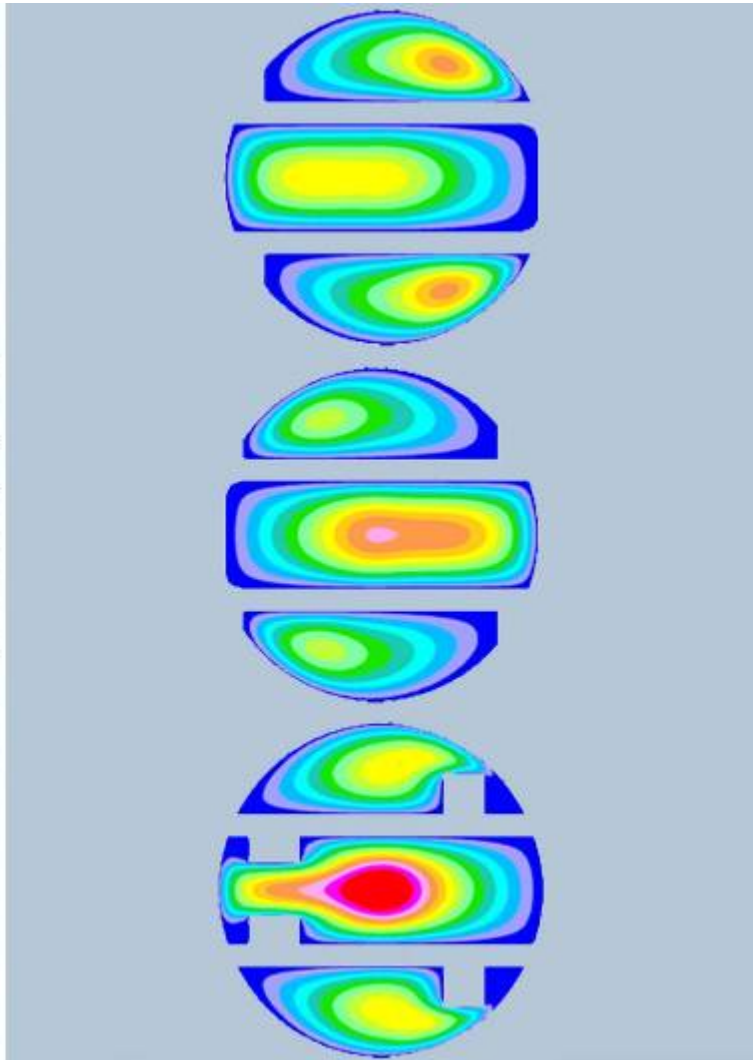


Outline and Objectives

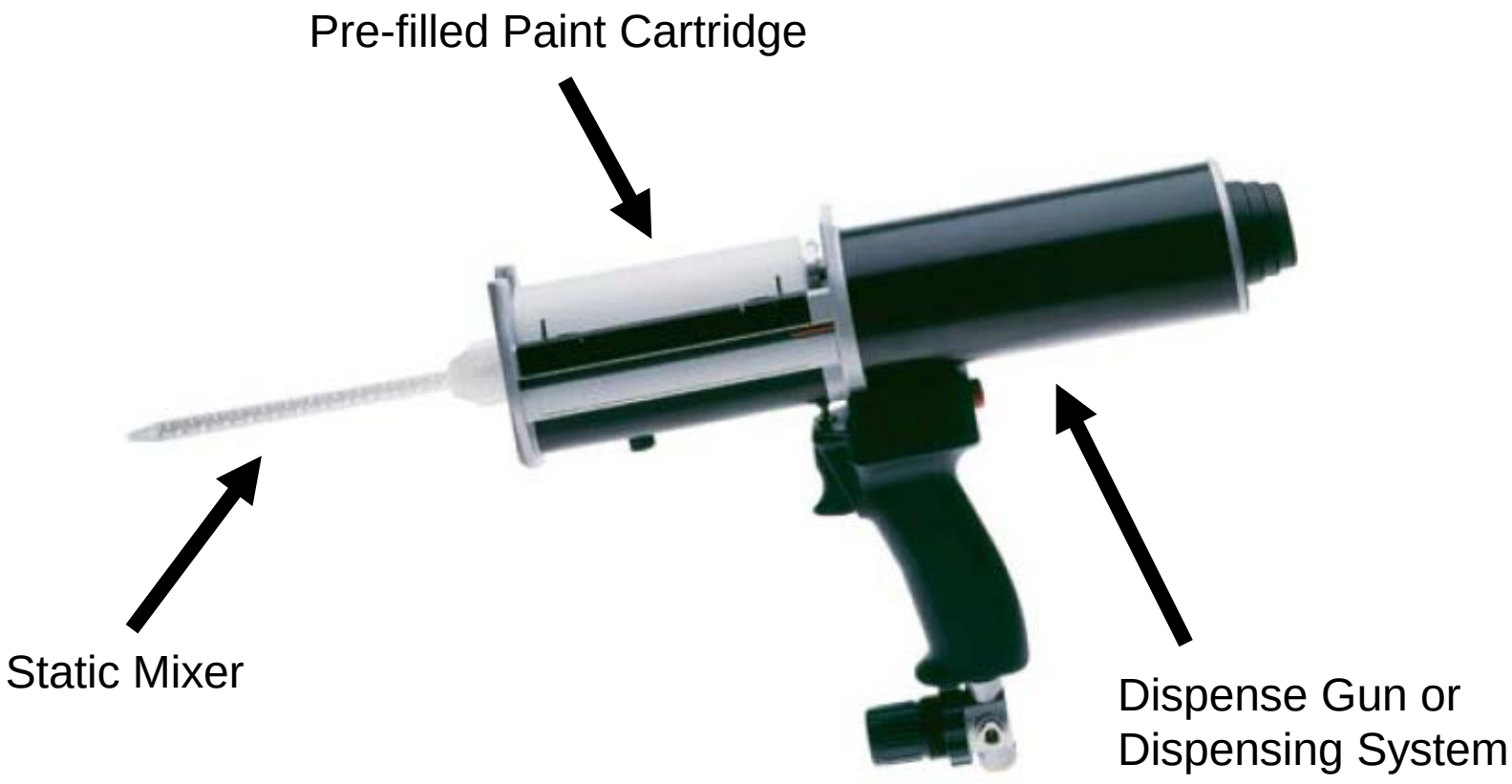
Key focus on Targeted Coating Application opportunities which drive excessive preservation costs

Bilges, Tanks, Uptakes, etc

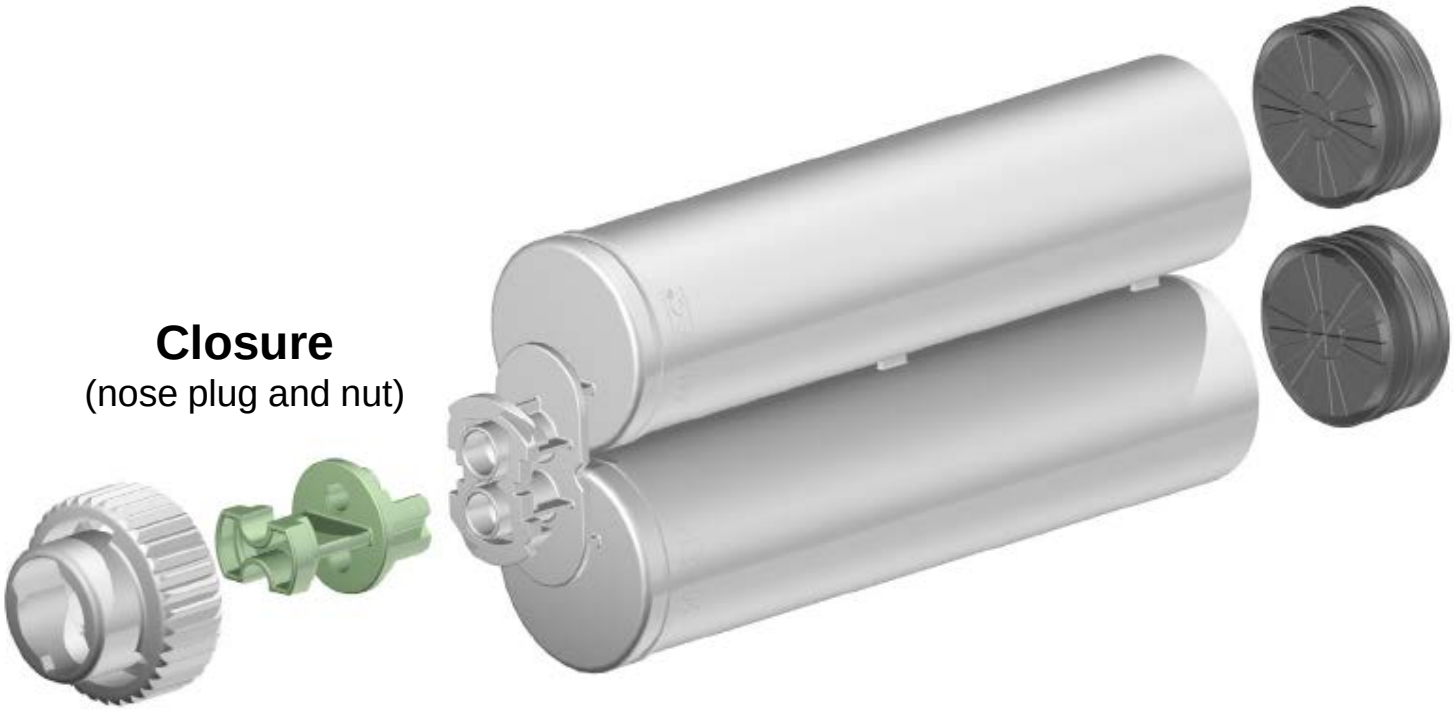
- Filling the “Gap” in paint application tools and packaging
- Integration with Shipyards and NAVSEA
- Use of Paint cartridges with advanced tooling – spray-roll-brush
- **Costs savings**
  - Reduction of man hours to paint specific sections of the ship
  - Provide Value Changes to reduce costs
  - Maintain/improve quality
  - Reduce waste streams
- Conform to Requirements, i.e. mix, application, film thickness

What is a Paint Cartridge System?

A complete system contains the following parts:



Paint Cartridges - Next Generation



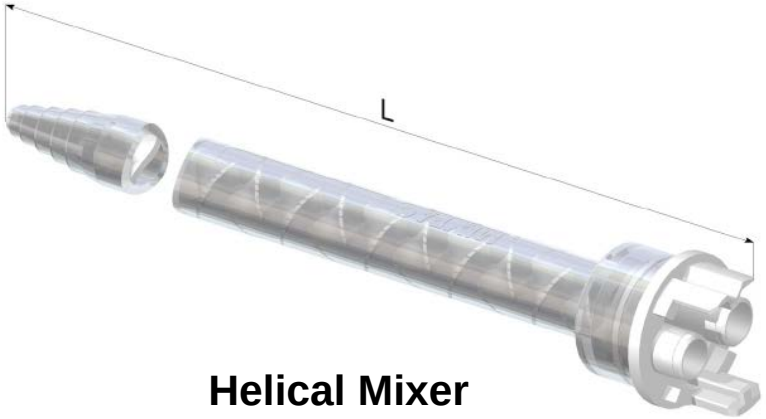
Pistons
Prevent leaking of the coating or paint

Closure
(nose plug and nut)

Cartridge Body
- Available in different mixing ratios
  1:1 / 2:1 / 3:1 / 4:1 / 10:1
- Available in different sizes from 200ml up to 1500ml
- Will be delivered filled from formulator
- No off ratio dosing possible
- Can be re-used later if not emptied at once

Static Mixer

Quadro Mixer



Helical Mixer

A static mixer is a mixer without moving parts
⇒ mixes the components with a defined efficiency based on the geometry and the number of mixing elements.

Advantages:

- Ensures efficient mixing quality
- Ensures the right mixing ratio
- Minimum loss of material
- Clean process

Dispensing System

Dispensers are available for all the different cartridge sizes. A change of the mixing ratio requires another dispenser or a different insert for the existing dispenser

Manual dispenser

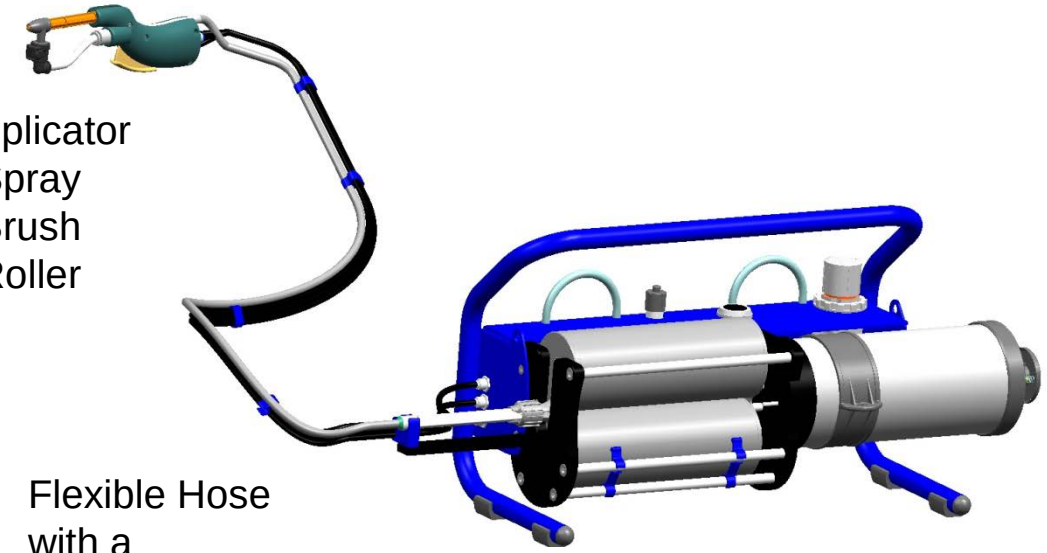
Pneumatic dispenser

Electric dispenser

Dispensing Systems for Special Applications

Cartridge Spray Application:

New Flex Hose System:



Applicator
- Spray
- Brush
- Roller

Flexible Hose with a Static Mixer

Cartridge

Pneumatic Dispenser

Function of the spray system

Film01?02_WMV 2Mbps.wmv

Video of the cartridge spray system

Preparation for a Paint Job

Mixing of the paints

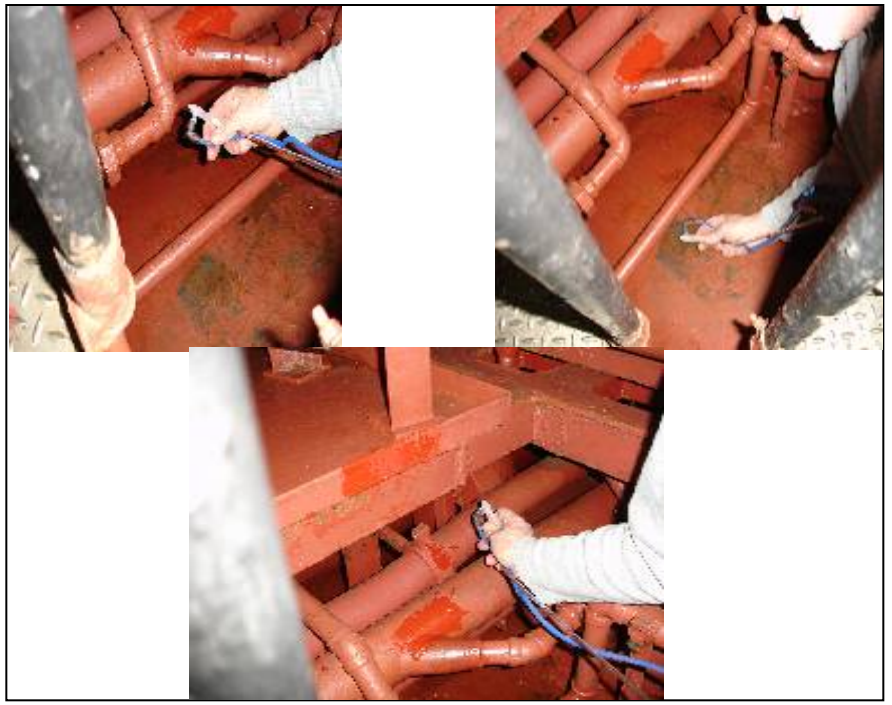
Distributing the paints into smaller buckets

The big mess afterwards

- With a cartridge system no premixing is needed at all
- The right mixing ratio is ensured because of the cartridge design
- Save man hour costs
- Eliminate the mess

Bilge Job

Existing application of the paint



Application with the new flex hose system

- Due to the restricted access areas, only small buckets can be used
- Manual brush and roll application very labor intensive
- Limited working pot life (~ 30-minutes)

- No time loss for mixing paint (Cartridge change in less than 1 minute)
- Most of the job can be sprayed with flex hose application system
- Significant reduction in execution time

Flex Hose Spraying of Bilge Coatings

Touch up Work

Existing application of the paint

Application with the new flex hose brush system

- Labor intense work as most of the paint needs to be manually brushed
- Must act quickly before paint sets
- Generates significant hazardous waste

- Elimination of the premixing step
- Cleaner & safer solution
- Brush or spray applications possible
- * Extends the working pot like of rapid cure paints*

Freeboard Touch up Kits - Polysiloxane

Existing application of the paint

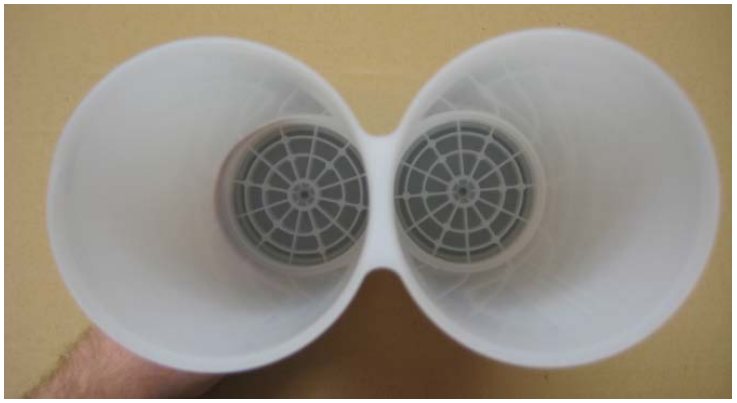
Application with the cartridge spray system

- **Very labor intensive as most of the paint need to be brushed or rolled**
- **Very often it is not economical to use high pressure spraying**

- **Most of the job can be sprayed (Much quicker than brushing)**
- **No need to install a huge high pressure spray application system**

Waste Management – NAVSEA CCAT

Mixing & Scraping Paint
Interbond 998



Empty cartridge and
static mixer

- 15-25% waste for a manual paint application
- Scraping buckets
- Breaking Kits required for small repair
- Generation of additional waste

- Virtually no coating remaining in cartridge after use
- 1-2% waste for a flex hose application
- < 1% waste for a cartridge spray application

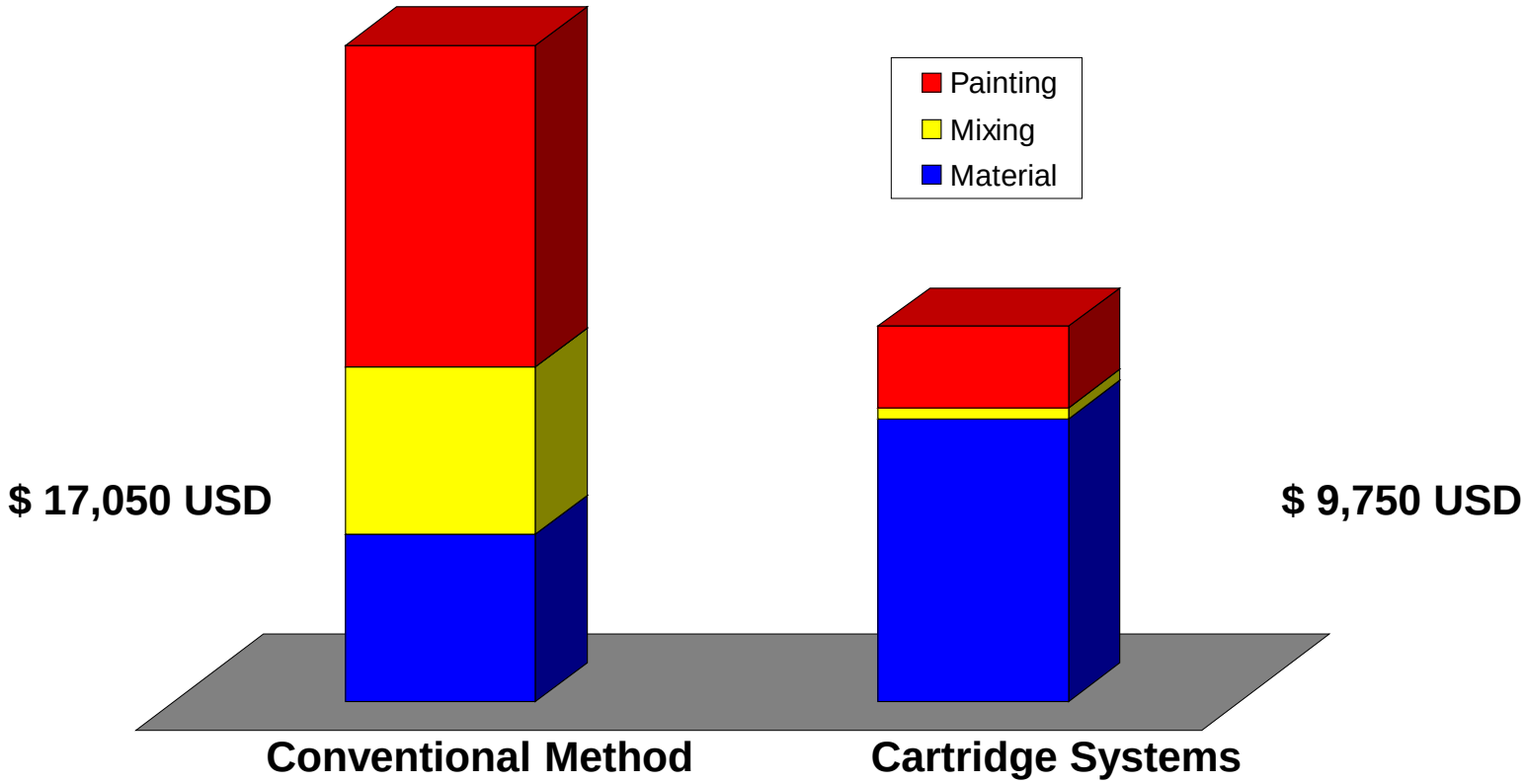
Cost Comparison for a Bilge Job

Data was collected with the Corrosion Control Assist Teams in Norfolk VA
Example using 5,000 square feet bilge area to paint
Depending on the type of bilge 40 to 50% of the area can be sprayed

	Conventional method	Cartridge Systems
Surface area for job:	5,000 square feet	5,000 square feet
Paint required:	48 gallons	163 cartridges
Waste of paint:	9.7 gallons $\Rightarrow$ 20%	1 gallons $\Rightarrow$ 2%
Cost of paint:	$ 4,350 USD	$ 7’350 USD
Man hours for mixing:	87 hours	5.5 hours
Man hours for painting:	167 hours	42.5 hours
Total Man hours:	254 hours	48 hours
Total Cost for Job:	$ 17,050 USD	$ 9,750 USD

* Uses $50/man-hour loaded rate

Cost Savings for a Bilge Job



- 36% reduction of total ownership cost through savings in painting
- 24% reduction of total ownership cost through savings in mixing
- 18% increase of total ownership cost through higher material costs

⟹ **43% overall reduction of total ownership costs**

Suitable Applications for a Paint Cartridge System

U.S. Navy Application	New Build	Maintenance / Repair
Bilge / Wet Spaces	Suitable	Ideal
Tanks / Voids	Suitable	Ideal
Flight decks (Non-Skid)	Not Suitable	Suitable
Superstructure	Not Suitable	Suitable
Freeboard	Not Suitable	Suitable
Underwater Hull	Not Suitable	Not Suitable

Ideal:	Paint Cartridge System is always the best choice
Suitable:	Depending on the size and accessibility paint cartridge system might be the best solution
Not Suitable:	Paint Cartridge System should not be used for that application

Summary

- **Paint Cartridge Systems**
  - ***A Good Alternative*** **to conventional paint application methods**

- **Cost Savings**
  - **For certain paint application areas, e.g., Bilges huge cost savings can be achieved by**
    - **Reduction of man hours for painting**
    - **Elimination of the premixing step**
    - **Minimization of wasted paint**

Choose the right application method for your paint job

- **Your formulator can assist by providing Packaging/Application solutions that are**
  - **Cost effective**
  - **Convenient, easy to use**
  - **Safe packaging**

Backup Data

Backup Calculations – Conventional method

- Notes:
- Interbond 998 covers 103 square feet/gallon at 14 mils dry film
  - For 5,000 square feet bilge area:
    - 48 gallon to cover
    - 9.7 addition gallons for waste
      - This uses the figure 20% loss factor
    - Total Paint required: 58 gallons
    - Cost of Paint (Interbond is $ 75.00 per gallon)
      - 58 gallons X $ 75.00 = $ 4.350

Backup Calculations Cartridge Systems

- Notes:
- Interbond 998 covers 103 square feet/gallon at 14 mils dry film
  - For 5,000 square feet bilge area:
    - 48 gallon to cover in cartridges
    - 1 addition gallons for waste
      - This uses the figure 2% loss factor
    - Total Paint required: 49 gallons
    - Cost of Paint (Interbond is $ 75.00 per gallon)
      - 49 gallons X $ 150.00 = $ 7,350
- Calculation for equal amount in cartridges_____
- 49 gallons X 3,750 ml/gallon = 183,750 ml paint
  - 183,750 ml divided by 1,125 ml/cartridge = 163 cartridges
- Cost of paint filled cartridges
  - $ 7,350

Backup Calculations Conventional Man-hours Mixing

- Mixing time:
  - 30 minutes per 1/3 gallon paint (Approx. 1 cartridge)
  - 58 gallons X 3 mixes per gallon = 174 mixes
    - 174 mixes @ 30 minutes per mix = 5,220 minutes or 87 man-hours
- Man-hours for painting conventional
  - ½ square foot per minute
  - 5,000 square feet X 2 = 10,000 minutes or 167 man-hours
- Total Man-hours:
  - 87 + 167 = 254 man-hours

Backup Calculations Cartridge Man-hours

- Mixing time:
  - 2 minutes per cartridge to set & start mix
  - 163 cartridges X 2 minutes per cartridge = 326 minutes = 5.5 man-hours
- Man-hours for flex hose spray application
  - 2 square feet per minute
  - 5,000 square feet divided by 2 square feet per minute = 2,500 minutes or 42.5 man-hours
- Total Man-hours:
  - 5.5 + 42.5 = 48 man-hours

Backup Calculations Waste in Cartridges

- Cartridge:
  - approx. 4ml in outlet of 940ml 4:1
  - approx. 5ml in outlet of 1000ml 3:1, 1125ml 2:1, 1500ml 1:1
- Mixer:
  - Waste volume in MCH 06-24T is approx. 3.5ml
- Flex hose system
  - ID of flex hose 0.43cm / length is 237cm => Waste volume is approx. 35ml
  - Flex hose should be replace after 30 cartridges
- Waste for the different cartridge applications:

	Cartridge Spray System	Flex Hose System (30 cartridges)
940ml 4:1	8ml waste ⇒ 0.9%	35ml + 225ml = 260ml ⇒ 1%
1000ml 3:1	9ml waste ⇒ 0.9%	35ml + 225ml = 260ml ⇒ 0.9%
1125ml 2:1	9ml waste ⇒ 0.8%	35ml + 225ml = 260ml ⇒ 0.8%
1500ml 1:1	9ml waste ⇒ 0.6%	35ml + 225ml = 260ml ⇒ 0.6%