BIO WATER BASED LIQUID PENETRANTS AND MAGNETICS: A SAFER AND COST EFFICIENT SOLUTION FOR TODAY

Speaker: Michele Cevenini

NDT ITALIANA – www.NDT.IT
Biography

Michele Cevenini is the managing director of NDT Italiana, one of the world’s most known non-destructive testing companies.

NDT Italiana has a very long experience manufacturing liquid penetrants, magnetic particles, ultrasonic couplants and UV lamps, and is focused on safety of operators and environment and the productivity of quality control.

Company

NDT ITALIANA
Via Del Lavoro 28
Concorezzo (MB) ITALY
+39 039 64 75 90
WWW.NDT.IT
INFO@NDT.IT
About us – Quality Pioneers

- NDT ITALIANA works since 1952 in the field of NON-DESTRUCTIVE TESTING. The headquarters are in Italy near Milan. A large area is devoted to production and goods stocking, to guarantee quick supply to customers worldwide.

- NDT Italiana is certified UNI EN ISO 9001 and approved NATO AQAP-120, and is equipped with internal Chemical and Electronic Laboratories, Technical Service, Specialised Consulting at the service of our customers.
NDT Italiana manufactures:

1. **LIQUID PENETRANTS:**
   - FLUORESCENT WATER BASED
   - RED WATER BASED AND TRADITIONAL OIL-BASED

2. **MAGNETIC PARTICLES:**
   - FLUORESCENT AND DUAL COLORED, BLACK

3. **ULTRASONIC COUPLANTS**

4. **UV LED LIGHTS**

About us – visit our website WWW.NDT.IT
About us – Quality Pioneers

NDT ITALIANA with its products and instruments meets the requirements of many key industrial sectors with turn-key solutions.

NDT Italiana’s Products are sold in over 100 countries:
Albania, Algeria, Angola, Argentina, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belgium, Bolivia, Bosnia Herzegovina, Brazil, Bulgaria, Canada, Chile, China, Colombia, Congo, Croatia, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, Equatorial Guinea, Estonia, Ethiopia, Finland, France, Germany, Great Britain, Greece, Holland, Hong Kong, Hungary, Iceland, India, Indonesia, Iraq, Ireland, Israel, Italy, Ivory Coast, Japan, Jordan, Kazakhstan, Kenya, Kosovo, Kuwait, Latvia, Lebanon, Libya, Lithuania, Luxembourg, Malaysia, Mali, Malta, Morocco, Mexico, Nepal, New Zealand, Nigeria, Norway, Oman, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Qatar, Romania, Saudi Arabia, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sudan, Sweden, Switzerland, Taiwan, Thailand, Trinidad, Tunisia, Turkey, Ukraine, United Arab Emirates, United States, Venezuela, Vietnam, Zimbabwe…
“Penetrant systems are to be classified as follows […]:
• Method A(W) Water washable – water containing ($\geq$ 20% water by volume)
### Safer Products – the BIO line

<table>
<thead>
<tr>
<th>Elite Bio NDT Products</th>
<th>Standard NDT Competitor Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHS02</td>
<td>Flammable</td>
</tr>
<tr>
<td>GHS07</td>
<td>Xi Irritant Xn Harmful</td>
</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>

Penetrant and Magnetic Bio products are not flammable, not harmful, not even irritant for the eyes or the skin, not polluting for the environment.
Bio Liquid Penetrants: Advantages for the operators and the environment

The VOC Solvents Emissions Directive (1999/13/EC) regulates the emissions of volatile organic compounds

**Safety Advantages:**
1. No flammability risk, not irritant for the eyes or the skin of the operator (water-based)
2. 0% Volatile Organic Compounds (VOC), no expensive air treatment with active carbon filtration needed, safe for the environment

**Cost Advantages:**
1. No costs of cabins with active carbon filtration for solvents (being water-based)
2. **Economical:** free of oil and other volatile solvents
3. Lower risks and costs associated with Environmental Protection Agencies
   - Same sensitivity and process parameters compared to traditional oil-based penetrants and solvent-based developers
Elite BIO line – Calculating the emissions reduction

NDT’s industry contribution to global targets (Paris Agreement, EU Climate Neutrality “Fit for 55”)

➢ Our NDT industry can contribute to the global targets by reducing the unnecessary use of VOCs during the quality control process.

➢ It is easy to calculate the economic advantage when using Bio liquid penetrants and magnetics. But how much can we really save in emissions when operators choose a COV–free alternative in liquid penetrants and magnetics?

➢ We measured:

1) **TVOC** (total volatile organic compounds) levels in mg/M³;
2) **CO₂** (carbon dioxide) levels in ppm.

while using different kinds of spray and cans water-based equivalent products, to be able to effectively show the quantity of emissions we can save by using water-based formulations.
Elite BIO line – using compressed air as propellant

NDT’s compared to polluting traditional propellants used in the NDT industry as butane/propane or CO2 gas

Spray Cans

Versus:

Bio water-based red penetrant and developer

Referee:
Elite BIO line – using compressed air as propellant

Elite NDT compared to polluting traditional propellants used in the NDT industry as butane/propane or CO2 gas

VOCs and CO$_2$ increase using spray cans
Elite BIO line – using compressed air as propellant

VOCs and CO₂ do not increase using Bio water based developer, penetrant or solvent.
Elite BIO line – using compressed air as propellant

Elite Bio compared to polluting traditional propellants used in the NDT industry as butane/propane or CO2 gas

<table>
<thead>
<tr>
<th>Product</th>
<th>VOC level (closed environment)</th>
<th>VOC level (with aspiration)</th>
<th>CO2 level (closed environment)</th>
<th>CO2 level (with aspiration)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Liquid penetrant spray A</td>
<td>Out of range (over 10 mg/m³)</td>
<td>3.8</td>
<td>Out of range (over 10k ppm)</td>
<td>3.400</td>
</tr>
<tr>
<td>Red Liquid penetrant spray B</td>
<td>1.6</td>
<td>1.3</td>
<td>1.400</td>
<td>1.000</td>
</tr>
<tr>
<td>Elite red penetrant K71 B2 Bio</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
</tr>
<tr>
<td>Developer spray A</td>
<td>Out of range (over 10 mg/m³)</td>
<td>Out of range (over 10k ppm)</td>
<td>9.300</td>
<td></td>
</tr>
<tr>
<td>Developer spray B</td>
<td>Out of range (over 10 mg/m³)</td>
<td>Out of range (over 10 mg/m³)</td>
<td>Out of range (over 10k ppm)</td>
<td>9.400</td>
</tr>
<tr>
<td>Elite DW52 water suspendable developer</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
</tr>
<tr>
<td>Solvent / Remover for penetrant A</td>
<td>Out of range (over 10 mg/m³)</td>
<td>Out of range (over 10k ppm)</td>
<td>9.300</td>
<td></td>
</tr>
<tr>
<td>Solvent / Remover for penetrant B</td>
<td>Out of range (over 10 mg/m³)</td>
<td>Out of range (over 10 mg/m³)</td>
<td>Out of range (over 10k ppm)</td>
<td>9.300</td>
</tr>
<tr>
<td>Elite 20 solvent remover</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
</tr>
<tr>
<td>Fluorescent magnetic spray A</td>
<td>1.2</td>
<td>0.5</td>
<td>1.900</td>
<td>700</td>
</tr>
<tr>
<td>Fluorescent magnetic spray B</td>
<td>0.8</td>
<td>0.5</td>
<td>1.600</td>
<td>1.100</td>
</tr>
<tr>
<td>Elite FW1 fluorescent dual water-based magnetic</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
</tr>
<tr>
<td>Fluorescent liquid penetrant Spray A</td>
<td>Out of range (over 10 mg/m³)</td>
<td>4.1</td>
<td>Out of range (over 10k ppm)</td>
<td>1.500</td>
</tr>
<tr>
<td>Fluorescent liquid penetrant Spray B</td>
<td>Out of range (over 10 mg/m³)</td>
<td>5.6</td>
<td>Out of range (over 10k ppm)</td>
<td>3.800</td>
</tr>
<tr>
<td>Elite K81B bio water based liquid penetrant</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
</tr>
<tr>
<td>Black magnetic spray A</td>
<td>4.1</td>
<td>3.4</td>
<td>4.300</td>
<td>3.500</td>
</tr>
<tr>
<td>Black magnetic spray B</td>
<td>1.7</td>
<td>0.9</td>
<td>1.700</td>
<td>1.300</td>
</tr>
<tr>
<td>Elite BW2C black water-based magnetic</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
<td>Zero (0)</td>
</tr>
<tr>
<td>No Products sprayed (ambient)</td>
<td>0.02</td>
<td>402</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

21 Degrees Celsius, Humidity 30%
Elite BIO line – using compressed air as propellant

Conclusions

- In every environment there is a different natural base level of TVOCs and CO2 depending on the Country / area, time of the day, so the measurements have been differential: values measured with no NDT activity versus values measured while applying solvent, penetrant, developer or magnetics.

- Different spray cans show a different level of TVOCs and CO2, depending on how much and which type of propellant is in use, and whether the base active product inside the spray can (example the liquid penetrant) contains VOCs or not.

- All water-based products have registered NO difference at all in the level of TVOCs or CO2, significantly contributing to reducing pollution caused by these components.

- Even working in a cabin with strong aspiration, not 100% of the pollutants are aspirated away: for this reason it is important to wear a suitable mask, and evaluate the use of Bio water based products.
Red Bio Liquid Penetrant indications on test block
Stable and reliable indications’ sizing over time

Penetrant Elite K71B2 BIO red penetrant+ Elite DWS2 developer

Left: few seconds after development
Right: 10 min after development

Form c developer allows twice as long developing time (2 hours max)

Competitor equivalent «B»
Left: few seconds after application
Right: 10 min after application

Too much bleed out = generation of false cracks + missing small ones
Company case studies in the Oil&Gas industry
Liquid Penetrant Inspection with Bio penetrants

➢ Large Valve producer for the Oil&Gas Industry

➢ Target: eliminate any risk for the operators and dangerous emissions (VOC volatile organic compounds) during quality inspection of Valves with liquid penetrants and magnetics

➢ Solution: Elite red Bio Penetrant K71B2 and white developer water suspendable Elite DWS2

➢ Easy to apply and economical, uses a compressed air spraying gun (no empty spray cans to dispose of)
Company case studies in the Oil&Gas industry

Liquid Penetrant Inspection with Bio penetrants

- Large producer for the Oil&Gas Industry
  - Target: large pieces to be inspected with max operator’s safety and environment care
  - Solution: water based penetrant Elite K71B2 bio
Company case studies in the Oil&Gas industry
Liquid Penetrant Inspection with Bio penetrants

- Using Elite K71B2.bio on large components
  - Less over spray in the air: the product is applied with a standard compressed air erogator (or by brush or dipping)
  - Less waste of empty spray cans and propellant gas in the air
Company case studies in the Oil&Gas industry
Liquid Penetrant Inspection with Bio penetrants

- Using Elite K71B2.bio on long components
  - Very long pipe
  - No possibility of air aspiration and active carbon filtration due to large size
Company case studies in the Oil&Gas industry
Liquid Penetrant Inspection with Bio penetrants

- Using Elite K71B2.bio on many small components

- When working with many components of small dimensions, it is a good idea to dip them in a tank with Elite K71B2.bio

- Advantages:
  - Faster productivity (many pieces covered with penetrant all together)
  - No aspiration needed on the tank
Company case studies in the Oil&Gas industry

Liquid Penetrant Inspection with Bio penetrants

- Using Elite K71B2.bio on Ship Parts

  - When working with large ship parts using Elite K71B2.bio is easier:

    - Less over spray in the air - the product is applied with a standard compressed air erogator

    - Less waste of empty spray cans and propellant gas in the air
Company case studies in the Oil&Gas industry
Liquid Penetrant Inspection with Bio penetrants

- Large producer for the Oil&Gas Industry
  - Target: use only water based risk free products to improve to sustainability profile of the Company
  - Solution: water based penetrant Elite K71B2 bio and Elite DWS2 white developer
  - Application tutorial
Company case studies in the Oil&Gas industry

Liquid Penetrant Inspection with Bio fluorescent penetrants

The importance of managing background even on rough surfaces

- Liquid Penetrant “Elite K81B” fluorescent Bio water based on a very rough surface. Background managed through the use of a pre-wash with emulsifier Elite E81B
Magnetic testing with our line of Bio Magnetics

➢ Also for magnetic inspection today is available the possibility to use a safer Fluorescent Bio Magnetic product

Cracks with Elite FW1AC Bio Water Based Fluorescent Dual Magnetic:
➢ No need to apply and remove white contrast paint!

Same Cracks with standard white contrast paint + black magnetic:
➢ Need to apply and remove white contrast paint!
Magnetic testing: new safer products

07.130 SYS SILVER YOKE SUPERLIFT 230 V CA
Most powerful AC Yoke on the market: allows you to work quickly with the best definition of indications
Maximum magnetic poles opening on the market: 18 inches (457 mm) across poles: for fast inspection of large parts
Best duty cycle: 50% (up to 2 minutes on - 2 minutes off)
Dimension 280x273x70 mm - 11 H x 10.75 L x 2.75 W in., weight 5.3 Kg - 12 lb

12.143 BAT12 LITHIUM BATTERY KIT FOR ELECTROMAGNETIC YOKES
Extremely light (800g / 28 oz.) portable kit including battery, small waist carrying bag and charger.
Allows a 12V power supply with battery operating time up to 4 hours.

12.142 BAT LITHIUM BATTERY KIT FOR INVERTER
New lithium battery kit that allows the use of the magnetic yoke everywhere with no wires!

12.142 INV PORTABLE YOKE INVERTER DC / AC
It allows to magnetize both in DC and AC!
1st yoke in the world lithium battery powered working DC and AC!
Highest portability: no wires linked to mains
Lightweight battery: only 800 grams (28 oz) in shoulder bag (included)
Voltage: 12V
Capacity: 9 A/h allows for an use of up to 4 hours (50% duty cycle) in AC and up to 8 hours (50% duty cycle) in DC.
Battery charger included.
Dimensions: 260 x 130 x 110 mm (10 x 5 x 4.5 in)
Company case studies in the Oil&Gas industry

Magnetic Particles Inspection with Bio magnetics

- Large producer for the Oil&Gas Industry

- Target: eliminate any risk for the operators and dangerous emissions (VOC volatile organic compounds) during quality inspection with liquid penetrants and magnetics

- Solution: Elite Bio Fluorescent Dual Magnetic particles FW1AC

- No risk for the operator or the environment, economical and fast: no need to apply and then remove the white contrast paint!
Conclusions

Bio water-based Liquid Penetrants and Magnetics for today

➢ In the past limited use due to:
  ➢ Lower environmental awareness
  ➢ Higher costs
  ➢ More difficult practical application process

➢ Today:
  ➢ Lower product costs
  ➢ Lower indirect costs (No disposal cost of spray cans)
  ➢ Higher environmental and sustainability awareness
  ➢ Global need to reduce emissions of VOC and CO₂
  ➢ Easy practical application process (but spray cans will always be used!)

Most companies choose a water-based product because of the lowest risk for the operators, but also the lower environmental impact and lower overall costs have had an increasing role in the decision by Companies to try these safer products.
Q & A SESSION

Thank you for your attention!

WWW.NDT.IT
info@ndt.it

Michele Cevenini
Linkedin Page «NDT Italiana»
Facebook Page «NDT Italiana»

NDT ITALIANA Proudly Supports Beat Leukemia Foundation
www.beat-leukemia.org
"The difference between difficult and impossible is that impossible takes longer. Miracles just require faith"