MONOLAYER ANTI-CORROSION POLYETHYLENE COATING
SUMMARY OF META(CLAY JSC PROJECT

GOAL
Polymer nanostructured composite materials production and products based on them.

PRODUCT MARKET OUTLETs
- cable industry
- petroleum industry
- pipe industry
- building industry

PRODUCTION POWER
META(CLAY JSC has a set of European equipment for extrusion and compounding. Production capacity is 90 thousand tons / year.
COMPOSITE MATERIALS OF METAACLAY JSC

Fiberglass pipe coating "Kolchuga" for protection during dragging by HDD method

Polyurethane coating Scotchkout ™ 352 with MONAMET ™ 1O4 nanomaterial for corrosion protection of pipes, fittings, valves and other metal structures

Monolayer anti-corrosion coating of pipelines (more reliable and cheaper in the production of pipes)

Powder anticorrosive polyethylene coating for fittings (elbows, tees, fittings, etc.)

Insulation and sheath of self-supporting insulated wires and power cables
PRODUCTS BASED ON COMPOSITE MATERIALS OF METACLAY JSC

- Biodegradable end plugs for pipe transportation and storage
- LITOMET is an electrically insulating lodgement, not subject to creep under load
- Repair materials for anti-corrosion coating of factory application (patch and repair pencil)
- Multilayer composite reinforced pipe for field pipelines and wells
- UKM covering material to protect anti-corrosion coating when laying in coarse rocky soils
MONOLAYER ANTI-CORROSION PE COMPOSITION

Monolayer polyethylene composition for anticorrosive coating of pipelines based on METALEN PE-21 material

METALEN PE-21 composition is adhesive active and can be applied to the following types of materials: steel, galvanized steel, aluminum alloy, fiberglass.

Production technology: compounding
APPLYING ADVANTAGES

Technology simplification

Application at extrusion line in factory conditions with standard equipment without adhesive layer

• Simplification of production technology
• Extruder release of the adhesive layer
• No coating defects at the pipe ends

Factory tests results for adhesion at $t = 28^\circ C$
STORAGE AND TRANSPORTATION ADVANTAGES

Creep reduction

- Less creep with constant load in time
- Geometry integrity of the coating with prolonged physical and mechanical impact
- No coating defects after long-term storage and transportation

Storage of the finished pipe with a monolayer coating with the least defects

Creep at a stress of 10 MPa, +25°C external protective pipes coatings

Laboratory test results
STORAGE AND TRANSPORTATION ADVANTAGES

**Toughness and elasticity**

- Frost-resistant and elastic material - ensuring long-term preservation of anti-corrosion insulation

<table>
<thead>
<tr>
<th>Test</th>
<th>Test conditions</th>
<th>Metalen PE-21</th>
<th>Analogue</th>
<th>Test conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notch Charpy value, KJ/m²</td>
<td>23°C, 2 J</td>
<td>53,2</td>
<td>33,1</td>
<td>GOST P 51164</td>
</tr>
<tr>
<td>Shore D hardness, c.u.</td>
<td>23°C, 2 J</td>
<td>61</td>
<td>58</td>
<td>GOST P 51164</td>
</tr>
<tr>
<td>Vicat softening temperature under load, °C</td>
<td>Press plate 4 mm,</td>
<td>123</td>
<td>117</td>
<td>GOST R 51164</td>
</tr>
<tr>
<td>Penetration at 80°C, mm</td>
<td>ISO 306</td>
<td>0,17</td>
<td>0,21</td>
<td>GOST R 51164</td>
</tr>
<tr>
<td>Tensile strain at break at (-45°C), %</td>
<td>GOST 11262</td>
<td>500-600</td>
<td>300-400</td>
<td>GOST R 51164</td>
</tr>
<tr>
<td>Tensile strain at break after 100 of air aging at (110±3)°C, %</td>
<td>Increase by 10-15</td>
<td></td>
<td>Decrease by 10-15</td>
<td>GOST 11262</td>
</tr>
</tbody>
</table>

*Laboratory test results*
**TRACK LAYING ADVANTAGES**

**Installation steps simplification**

- No additional stripping of coating ends of the pipeline joint
- 30% increase in adhesion strength between coating and sleeve
- Increased durability of the weld under the sleeve

<table>
<thead>
<tr>
<th>Pipe coating temperature</th>
<th>Studied type of material pair</th>
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<tbody>
<tr>
<td>95 °C</td>
<td>«Metalen PE-21» + TIAL MGP</td>
<td>Foreign analogue + TIAL MGP</td>
</tr>
<tr>
<td></td>
<td>171 N/cm</td>
<td>123 N/cm</td>
</tr>
<tr>
<td>105 °C</td>
<td>186 N/cm</td>
<td>142 N/cm</td>
</tr>
</tbody>
</table>

*Laboratory test results*
ADVANTAGES OF METALEN PE-21 COMPOSITION

For pipe production factories
Higher coating speed, better performance.
Ease of use, less concomitant operations.

For transport companies
High resistance to mechanical stress.
Fewer coating defects during loading and unloading.

For storage companies
Extended temperature storage range.
Fewer coating defects during long-term storage.

For construction companies
Simplify weld insulation technology.
Reduction of technological operations during the cuff imposition.
The durability of the weld under shrink sleeve.