



System driven injection by the MIP-In









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11 partners


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upsoil **Objective**

- ⚡ Take forward an innovative system that simultaneously combines
- ⚡ detection of contaminants
- ⚡ with injection of degradation agents
- ⚡ only there where contaminants are detected
- ⚡ → improved cost effectiveness and sustainability
 - When in-situ injection approach is applied to remediate soil & GW

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upsoil **How ?**


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|---|--|
| <p>Cost effective</p> <ul style="list-style-type: none">• Reduced consumption of product• Reduced project life span and time consumption• Minimize required mobilizations (injections)• Optimized effect of product injected• An operational and solid system <p>Environmental sustainable</p> <ul style="list-style-type: none">• Minimized consumption of energy / product• Minimize risks of negative environmental impact• Minimize disturbance of uncontaminated soil/GW | } Targeted injection Only where contamination Injection vol. ↔ contamination level |
| | } Flexible system Different products - "mixtures" Flow rate / pressure Concentration variability |
| | } Real time data / logging (contamination / injection) Decision making in the field Documentation. |

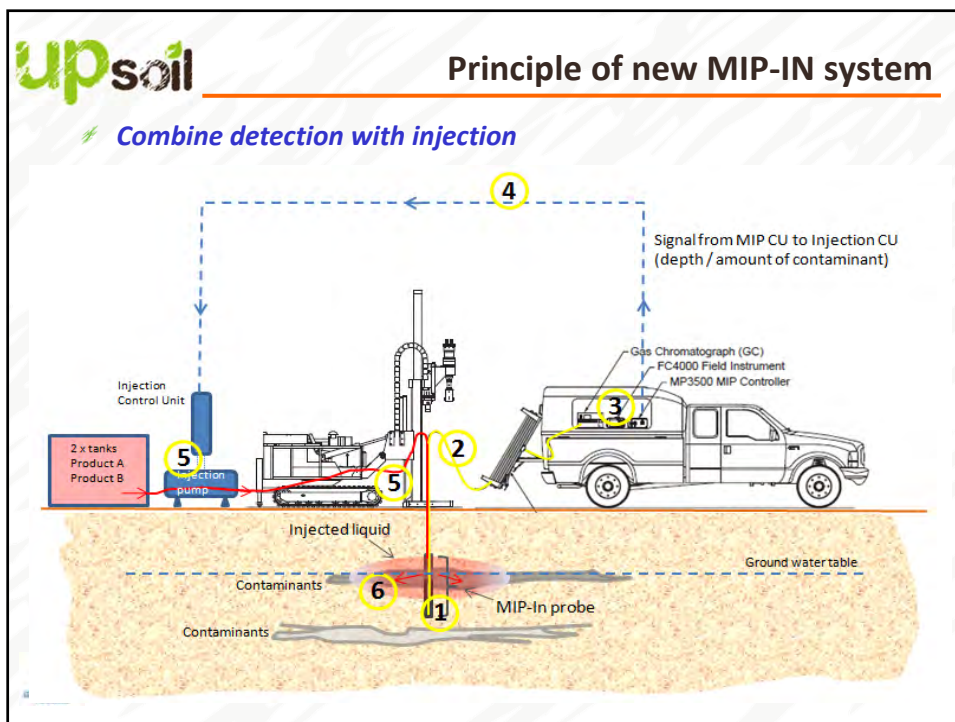
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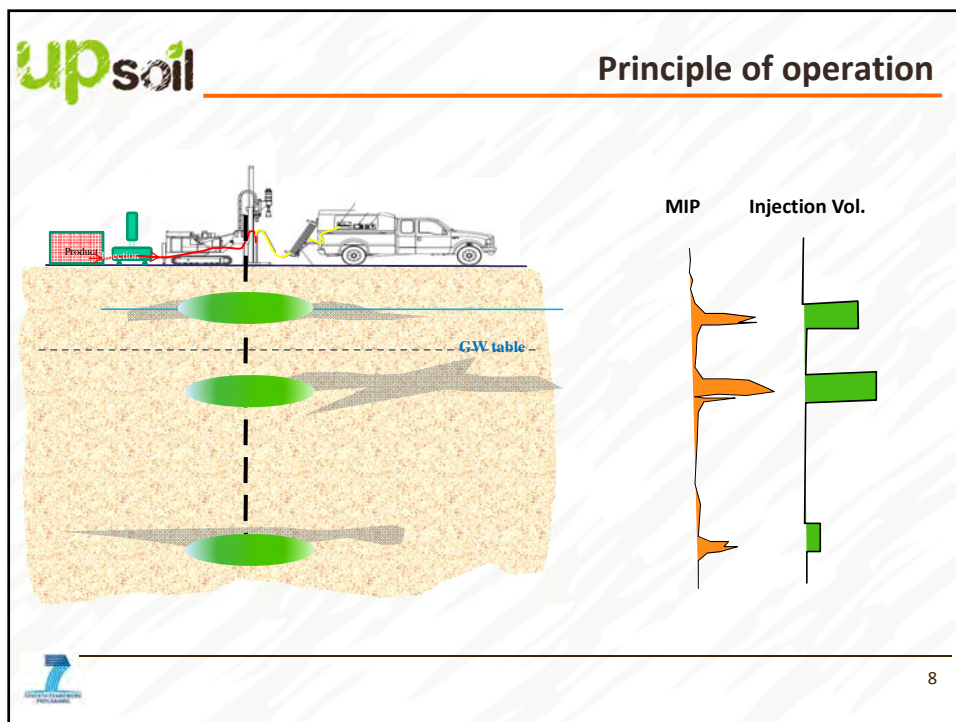
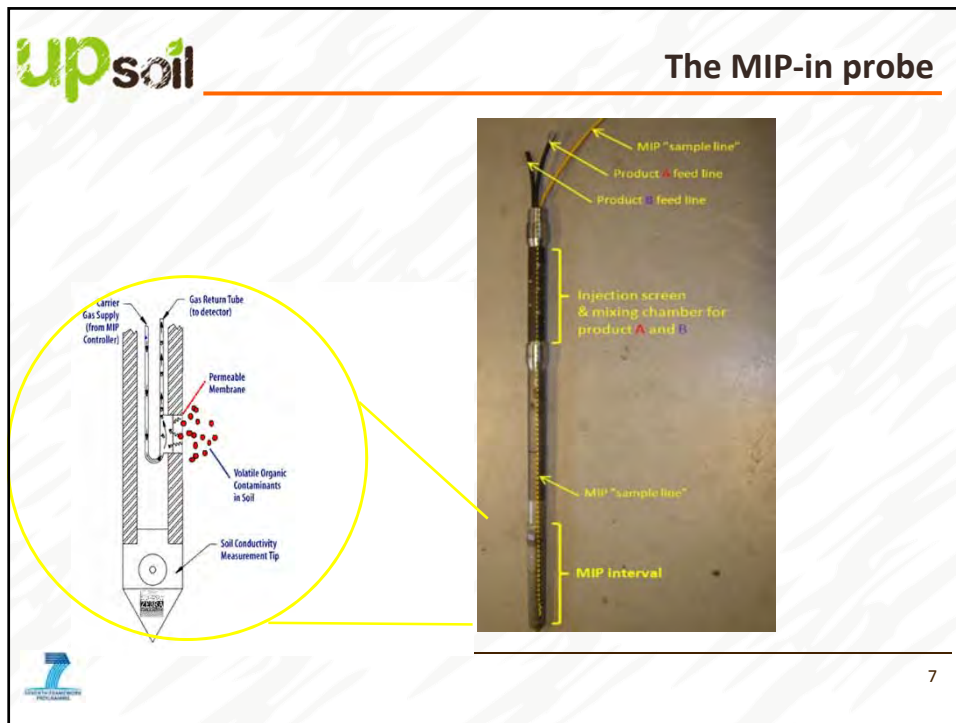
upsoil **Traditional approach : 2 phases**

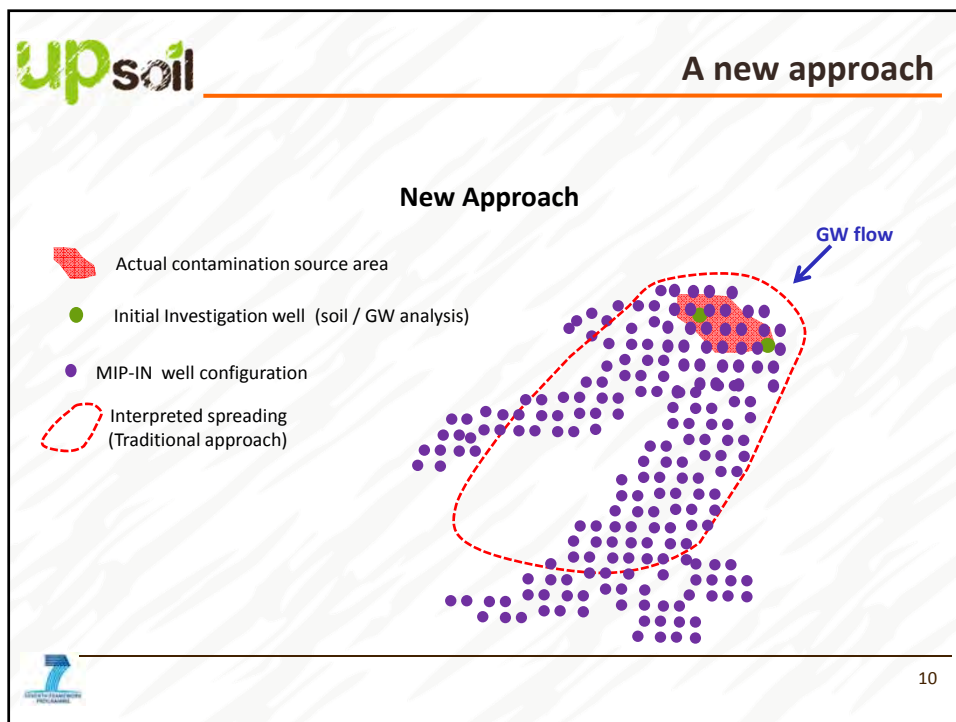
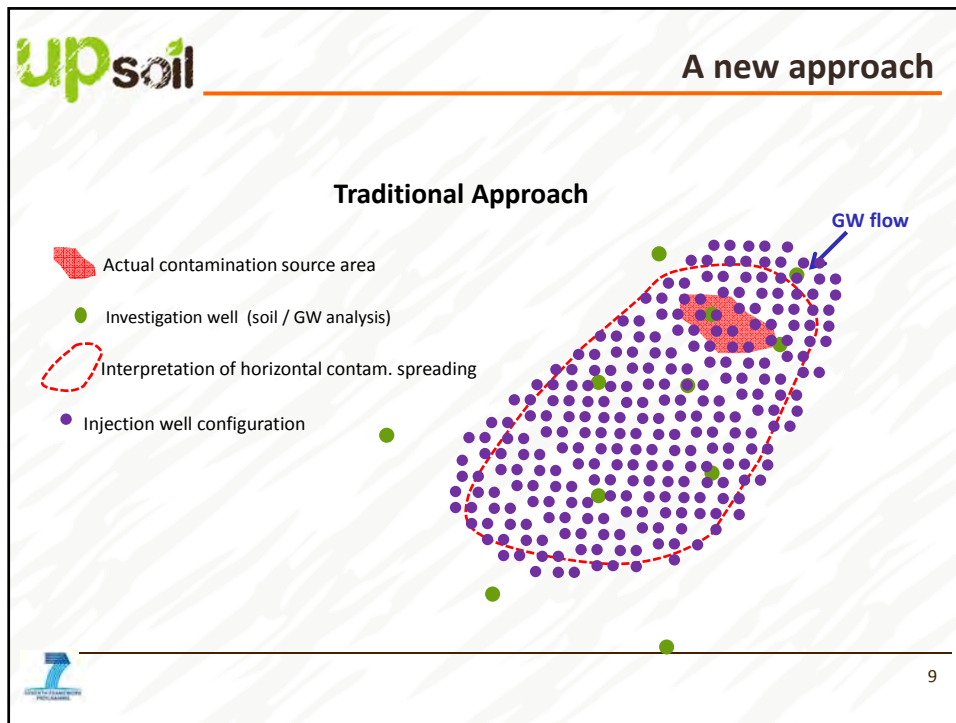
Data collection → Lab./reports/design/meetings etc. → **Injection**

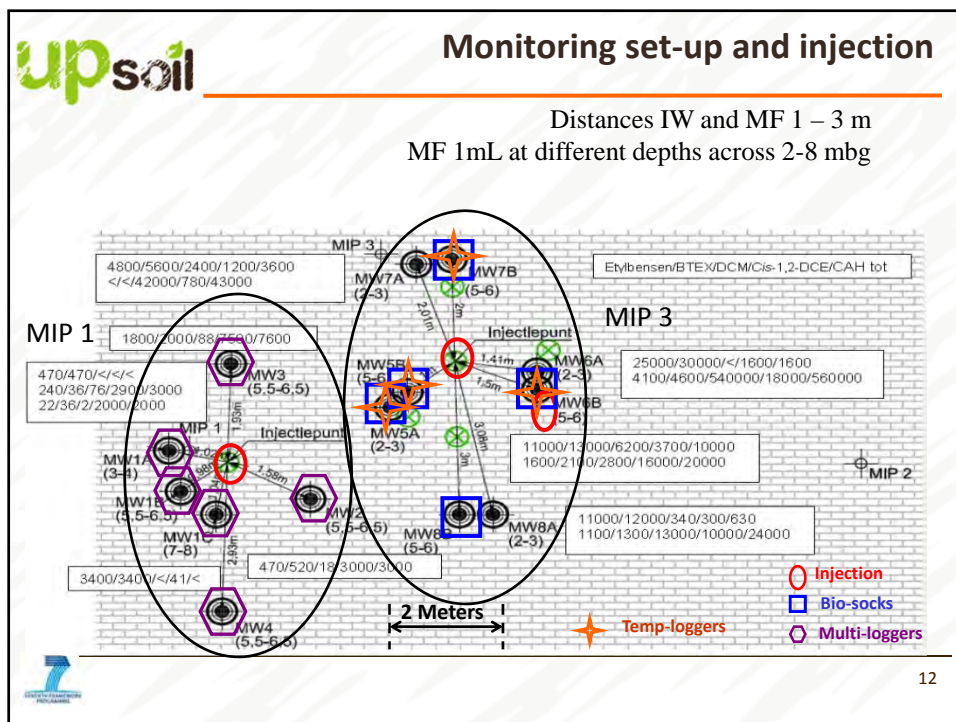
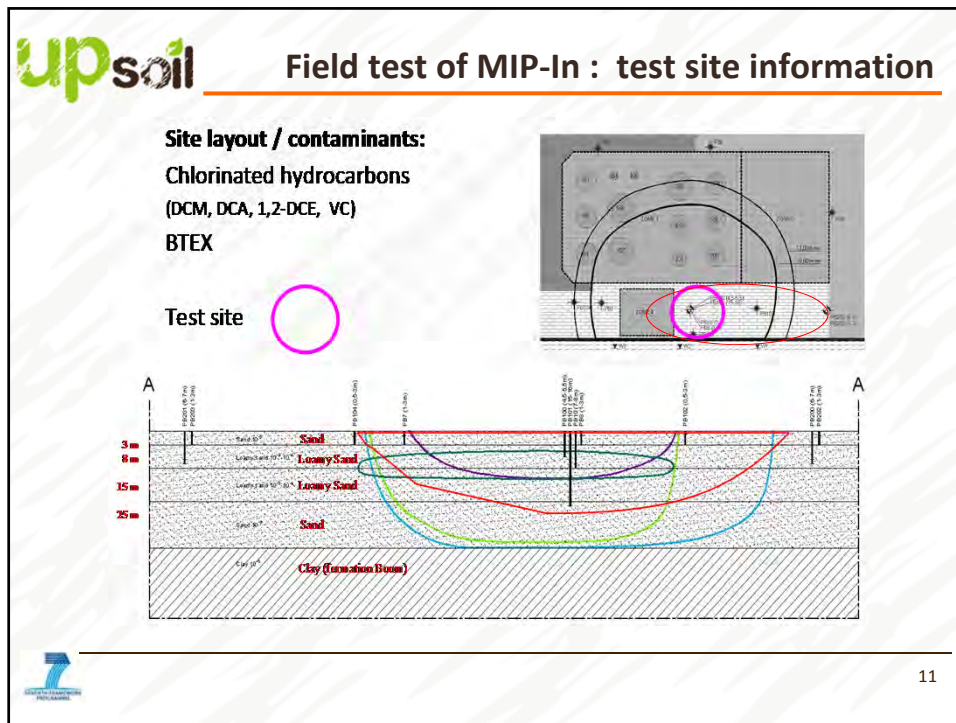


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- ⚡ Lab tests : permanganate superior over various formulations of Na-persulfate; SOD determined
- ⚡ Injection permanganate at 3 points, 2 to 7 mbg
- ⚡ Injection of 332 kg NaMnO_4 in app. 4 m³ injection solution
- ⚡ Arrival of oxidant in closest wells:
 - - purple colour
 - - redoxpotential ↑↑
 - - electrical conductivity ↑
- ⚡ Immediate injection radius of influence: 1 to 2.2 m
- ⚡ Heterogeneous geology → heterogeneous distribution of oxidant

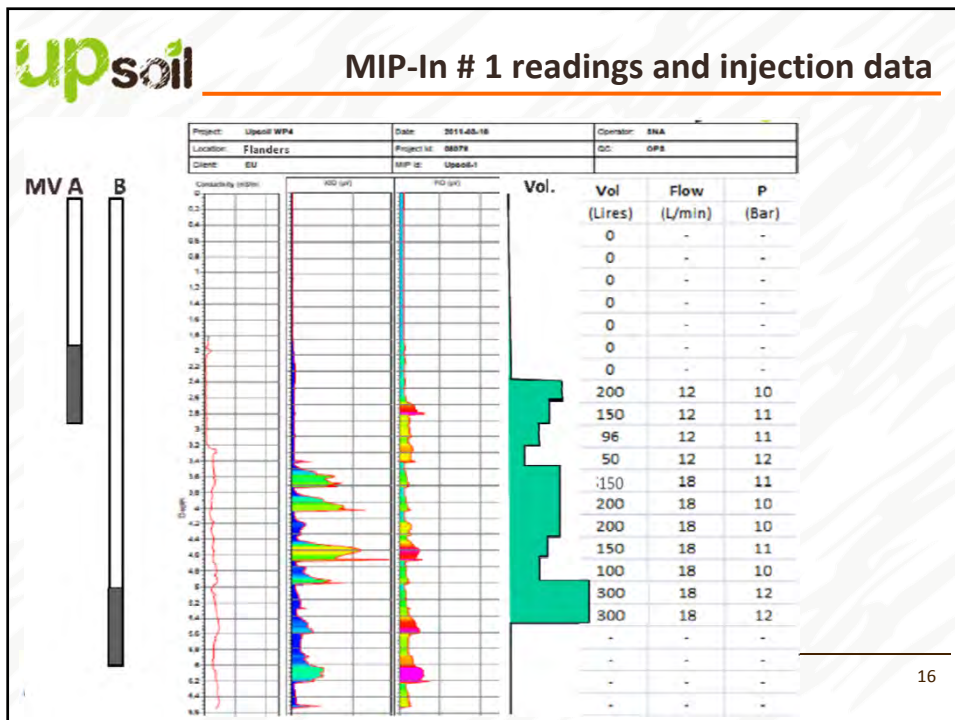


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upsoil **Test of system**




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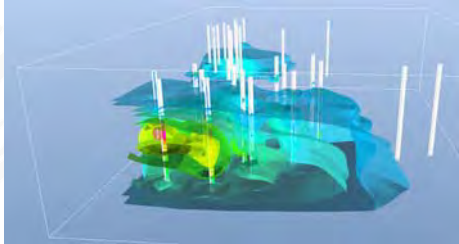
upsoil **Achievements**


- ✦ **Cost effective**
 - Reduced consumption of products; equipment; time”
 - optimized effect of product injected - targeted and balanced injection
 - Increased probability for full “remediation coverage” (large quantities of MIP data)
- ✦ **Environmental sustainable**
 - Minimize risks of negative environmental impact
 - Minimize disturbance of uncontaminated soil/GW
 - Minimized consumption of energy / product

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upsoil **Achievements**


- ✦ **Flexible system** 😊
 - Different products - “mixtures”
 - Flow rate / pressure
 - Concentration variability
- ✦ **Real time data / logging** 😊
 - Decision making in the field (Triad Approach)
 - Documentation
 - Large data amount – quality / decision making.



Interpretation of MIP data

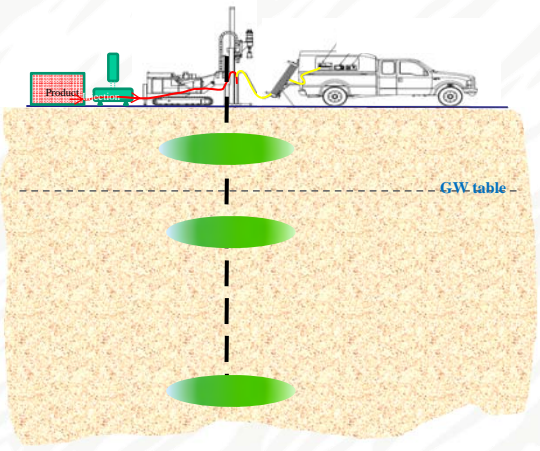
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upsoil **Future Developments**

- ⚡ Applicable also for more viscous remediation products
- ⚡ like: EHC, Newman Zone, EZVI, BOS100/200
- ⚡ Injection depth challenges when increasing radius of rods
- ⚡ Also high flow / pressure applications (fracturing)
- ⚡ Full scale project experiences required => limitations / challenges etc.
- ⚡ Optimize operation and improve solidity of the system


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Thank You !

Questions?

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