# Bringing State-of-the-Art Technology to a Developing Country:

### A Capacity Building and Knowledge Transfer Success Story

### Jim Galligan – TerraTherm, Inc.

Gorm Heron, John Bierschenk, Richard Michalewich and Stanley Walker, Glenn Anderson, Tim Burdett, Dzung Tran, Christopher Pruitt - **TerraTherm, Inc.** Kent Sorenson, Peter Chenevey – **CDM Smith** 







### Acknowledgements



### The Danang Airbase project was funded by USAID and USAID has approved TerraTherm's use of project data for this presentation







### **Dioxin Contamination at Danang Airbase**











### **Danang Project Team**









### Supporting the Mission

- Delivering "Aid from the American People"
  - End extreme poverty
  - Promote development of free, peaceful and self-reliant societies
  - Help people and governments in developing nations build human capital
- Critical objective for Danang Project: Capacity Building
  - Teach, train, transfer knowledge







### What Was Accomplished?

- Implemented first-of-its-kind remediation system supported by local Vietnamese contractors & employees
- Trained local Vietnamese workers to international safety standards; Worked >400,000 hours without lost time incident
- Treated >87,000 m<sup>3</sup> soil/sediment
  - Starting with high levels of dioxin (mean 56,000 ppt)
  - Treated to <150 parts per trillion (ppt); Most treated below <1 ppt.
- Significantly reduced the risk of dioxin exposure to the people and environment of Vietnam for an improved quality of life







## IPTD<sup>®</sup> Technology

- Thermal Conduction Heating (TCH)
- IPTD<sup>®</sup> = Aboveground TCH
- Treatment Goal:
  - Soil & sediment: <150 ppt
  - 325°C for ~21 days









a Cascade Compan







### **IPTD®** System Construction

IPTD® pile construction & filling







Insulating cover

Heater installation





### Completed surface – Phase 2





ERRATHERM







### IPTD<sup>®</sup> System in Operation











### Local Weather Challenges



















# IPTD<sup>®</sup> System Operation

### Phase 1 (2014/2015)

- 43,348 m<sup>3</sup>
- Heated 413 days
- Mean Post-treatment: 8.9 ppt TEQ Dioxin
- ~90% 97% DRE

### Phase 2 (2016/2017)

- 43,747 m<sup>3</sup>
- Heated 205 days
- Mean Post-treatment: 0.199 ppt TEQ Dioxin
- >99.99% DRE



### **Temperature Monitoring**



### Plant Effluent Monitoring

# Vapor Dioxin TEQ Concentration vs. Average Pile Temperature





# Capacity Building: How?

- Identify & pre-qualify local partners and suppliers
- Communicate standards and expectations
- Provide training
- Work together to achieve goals
- Collaborate & communicate with Government officials
- Provide learning opportunities for Government officials & public







## Capacity Building: Partners & Suppliers

- Identify Partners & Suppliers
- Communicate standards and expectations



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# Capacity Building: Training

- Construction safety
- Health & safety
- Quality standards
- "Train-the-Trainers"





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# Capacity Building: Training

- Provided 1,396 individual trainings
- Over 6,300 hrs of training to VN staff







Arrest System (PFAS)

Safety Net

truction Management and Oversight of the Environmental Remediation at Da Nang Air

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# Capacity Building: Quality Standards

- International quality standards
  - Manufacturing
  - Construction
- On-site quality control inspections















## **Capacity Building: Quality Standards**

- International quality standards
  - Manufacturing
  - Construction

### Manufacturer QC **Documentation**

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2	Technical Review Card - Certificate of Origin: Seamless Steel Pipes; Fittings - Mill's Test Certificate: Seamless Steel Pipes; Fittings	2-Oct-13	2-Oct-13	HEBEI SHANGTIAN	ок
3	Procedure of Welding - For Structure - For Piping	14-Sep-13	02-Oct-13	Lilama 7	ОК
4	Procedure of fabrication and installation	14-Sep-13	02-Oct-13	Lilama 7	OK
5	Procedure of Painting	7-Oct-13	7-Oct-13	Lilama 7	OK
6	Daily Report of Fabrication	5-Nov-13	5-Nov-13	Lilama 7	OK
7	Receiving/incoming quality control sheets -For support of piping -Forb spool of pipe	10-0et-13	10-Oct-13	Lilama 7	ОК
8	Fabrication completion inspection report	Oct-13	Oct-13	Lilama 7	OK
9	Welder certificate	5-Nov-13	5-Nov-13	Lilama 7	OK
10	Fabricated support Type 1	20-Nov-13	20-Nov-13	Lilama 7	OK
11	Fabricated support type 2	20-Nov-13	20-Nov-13	Lilama 7	OK
12	Fabricated support type 3	20-Nov-13	20-Nov-13	Lilama 7	OK
13	Inspection sheet for fabricated Pipe spool & Compensator	26-Nov-13	26-Nov-13	Lilama 7	OK
14	Inspection sheet for fabricated Pipe spool of air axtraction pipe vapor manifold line 1 PO-43	26-Nov-13	26-Nov-13	Lilama 7	OK
15	Inspection sheet for fabricated Pipe spool of air axtraction pipe vapor manifold line 2 PO-43	26-Nov-13	26-Nov-13	Lilama 7	OK
16	Inspection sheet for fabricated Pipe spool of air axtraction pipe vapor manifold line 3 PO-43	26-Nov-13	26-Nov-13	Lilama 7	ОК
17	Inspection sheet for fabricated Pipe spool of air axtraction pipe vapor manifold line 4 PO-43	26-Nov-13	26-Nov-13	Lilama 7	ок
18	Inspection sheet 1: Install support for pipe of Vapor Manifold	3-Mar-14	3-Mar-14	Lilama 7	OK
19	Inspection sheet 2: Install compensator of Vapor Manifold	3-Mar-14	3-Mar-14	Lilama 7	OK
20	Inspection sheet 3: Install piping of Vapor Manifold	3-Mar-14	3-Mar-14	Lilama 7	OK
21	System flushing certificate PO-043	15-Mar-14	24-Mar-14	Lilama 7	OK
22	Inspection sheet for Pipe Slope & Pipe Dimensions	10-Feb-14	17-Feb-14	Lilama 7	OK
23	Piping pressure test certificate	26-Mar-14	29-Mar-14	Lilama 7	OK

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	CASCADE
1	DRILLING   TECHNICAL SERVICES



# Capacity Building: Collaboration

- Split samples with GVN scientists
- Data sharing
- GVN scientists conducted parallel sampling & analysis at local VN labs

















# Capacity Building: Collaboration

- Coordination meetings with GVN officials
- Technical workshops for scientists & regulators
- Community outreach meetings















# Capacity Building: Results

- Technical success! Project remediated dioxin contamination, improving conditions in the local environment
- Implemented "first-of-its-kind" innovative technology approach with major contributions by local Vietnamese workforce
  - Large Vietnamese workforce trained to international standards for safety & quality
  - Major equipment fabrication and construction activities performed by local Vietnamese contractors
- Enhanced collaboration with Vietnamese scientists & Agency representatives







### Capacity Building Model

**Roles & Benefits** 

International Experts

- Bring technology
- Teach & train
- New methods & techniques

Local Partners

- Aptitude & skills
- Local expertise & know-how
- Workforce: New knowledge

Government & Public

- Collaboration & support
- Enhanced human capital
- Increased standard of living
- Improved environment







### Câu hỏi?



### Questions?







### Thank you

Jim Galligan TerraTherm, Inc. +1 978-730-1214 jgalligan@terratherm.com

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