

# Power Generation & Substation Oil Spill Prevention Principles & Practices



## Oil Spill Prevention Basic Principles & Practices

1. **Look** for areas where leaks may occur
2. **Know** type of oil/fuel
3. **Expect** a leak to occur & worst case volume
4. Check lists do not always replace **common sense**
5. **Double check** before startups (containment points, containers, hoses, connections, pumps, levels in tanks, manways, vents)
6. **Provide equipment redundancy**, pumps, hoses, etc.
7. **Monitor** during operation
8. **Rapid release identification, notification, and response** to limit impacts
9. **Lessons learned** from each incident, and corrections as necessary



2

## Power Plant Oil Type Distribution

Source	Example	Oil Type
Electrical Equipment	transformers, circuit breakers, capacitors, regulators, thrust & guide bearings, turbines, governors, cranes, lifts, hydraulic gates & motors, generators, boilers, heat exchangers	D, H, T, L, C
Containers	ASTs, USTs (Used Oil), OWS, frac tanks, temporary fueling tanks, tankers, drums, totes	FO, DF, G, K, UO, D, H, L, C
Conveyance Equipment	pipelines, hoses, pumps	FO, DF, G, K, UO, D, H, L, C
Construction Equipment	lifts, forklifts, cranes, bobcats, excavators, service trucks, vehicles, generators, compressors, heaters	DF, G, K, UO, MO, D, H, L, C

D = dielectric, H = hydraulic, T = turbine, L = lubricant, C = compressor,  
FO = fuel oil, DF = diesel fuel,  
G = gasoline, K = kerosene, UO = used oil, MO = motor oil



3

## Potential Oil Impacts & Regulatory Criteria

Oil Spill Fate	Regulatory Criteria
<ul style="list-style-type: none"> <li>• Personal Contact</li> <li>• <u>Sensitive Receptors</u> <ul style="list-style-type: none"> <li>– Surfacewater, ponds, streams</li> <li>– Soil, groundwater</li> <li>– Water intakes, wells, drinking water</li> <li>– Wetlands, National Parks</li> <li>– Aquatic life, fish, plants, birds</li> <li>– Marinas</li> </ul> </li> <li>• Flooding – structures</li> <li>• Ignition sources</li> <li>• Power equipment</li> </ul>	<p><b>Reporting Quantities</b></p> <p>Spill offsite</p> <p>Sheen or potential sheen on water</p> <p><b>Regulated Parameters</b></p> <p>Total Petroleum Hydrocarbons DRO (fuel oil, diesel fuel) GRO (gasoline) PAHS (diesel fuel) Heavy Metals (used or waste oil) PCBs (dielectric fluid) Semi-Volatiles (diesel fuel, fuel oil) Volatiles (gasoline)</p>



4



## Common Release Causes

*Simultaneous occurrence of three or more unlikely events*

- **Human error** is No. 1 cause of releases, distractions, cell phones, health crisis
- **Spills during transfers** (loading & unloading)
  - Pumping against closed valves or non-vented containers
  - Equipment, hose impacts
  - Overfills, overloading
  - Failure of pump, hose, valves, container, fittings, secondary containment
  - Valves left open
- **Product incompatibility** with container, hoses, pump, fittings
- **Wrong product** transferred
- **Road Hazards** puncturing fuel tanks, curbs
- **Adverse weather**, lighting, tornados, heat, freezing, flooding
- **Fires, explosions**, power surges, overloads
- **Accidents**, rollovers, crashes
- **Sabotage** (bullets, opening valves)

 **Remtech Engineers**  
Remediation Specialists

5

## Potential Leak Points To Look For


<b>Containers</b>	seams, welds, shell, corrosion, manways, valves, flanges, gaskets, appurtenances, structural supports
<b>Pumps</b>	seals, prime/cleanout ports, housing, gaskets
<b>Hose</b>	fittings, hose clamps, gaskets, hose walls
<b>Valves</b>	packings, stems, gaskets, housings
<b>Pipes</b>	welds, threads, flanges, walls, fittings, corrosion, supports
<b>Manways</b>	gaskets, seatings, bolts tight & not missing
<b>Containment</b>	liners (punctures, seams, delamination), capacity, drains, valves

 **Remtech Engineers**  
Remediation Specialists

6

## General Prevention


- **Require spill prevention in site safety plan:**
  - MSDs, hazard communication
  - spill prevention, response and reporting
  - site map with containment points, fueling areas, drains, ditches, ponds, streams
  - spill kit content, availability & locations
  - transfer procedures (see next slide)
  - emergency shutdown procedures
  - tailgate meetings at beginning & end of each day
  - SPCC training & qualified operator present during transfers
  - monitor weather forecast, conditions change when it rains!
- **Transfer inside containment areas** or provide containment where possible, spill containment valves closed, sufficient rain freeboard, during day light hours
- **Escort equipment**
- **Maintain inventory records.** Order oil/fuel amount that will fill container to **90% of capacity**. Account for product already in container
- **Hoses & lines drained** at end of transfer
- **Prevent spread** of spills (tracking or flowing)

 **Remtech Engineers**  
Remediation Specialists

7

## Example Transfer Checklist

<input type="checkbox"/> Transfer inside containment area or provide containment <input type="checkbox"/> Confirm quantity & type of oil to be transferred <input type="checkbox"/> Spill containment valves closed and sufficient rain freeboard available <input type="checkbox"/> Drains covered <input type="checkbox"/> Transfer during day light hours only <input type="checkbox"/> Spill kits available <input type="checkbox"/> Qualified operator present during transfers <input type="checkbox"/> Confirm product entering correct container <input type="checkbox"/> Check fluid levels in initiating & receiving container & at regular intervals <input type="checkbox"/> Vents open/not obstructed <input type="checkbox"/> Hoses, pumps, pipe, and container rated for specified oil <input type="checkbox"/> Transfer lines, hoses, pumps leak tested <input type="checkbox"/> Hoses sufficient length and diameter <input type="checkbox"/> Camlock fittings with self-sealing or double ball valves with end caps available	<input type="checkbox"/> Wheels chocked on temporary containers <input type="checkbox"/> Proper hose supports <input type="checkbox"/> Check all gaskets <input type="checkbox"/> Walk transfer lines and hoses and check for leaks or damage <input type="checkbox"/> Place drip pans under connections <input type="checkbox"/> Check that valves in proper position <input type="checkbox"/> Grounding cables when appropriate <input type="checkbox"/> Emergency shutdown procedures <input type="checkbox"/> Hose draining procedures <input type="checkbox"/> Pre-transfer meeting <input type="checkbox"/> Communications during transfer <input type="checkbox"/> Transfer at reduced rate initially <input type="checkbox"/> When transfer complete – close correct valves <input type="checkbox"/> Confirm container empty <input type="checkbox"/> Conduct a post transfer meeting
--	---

 **Remtech Engineers**  
Remediation Specialists

8

## Container Checks

- ✓ **Integrity testing & documentation** (not leaking & clean), plate on container, visual, metal thickness, weld inspections, foundations
- ✓ **Proper container** for transfer - drums have DOT/UN rating on side, totes DOT rating on side panel, frac tanks have plates on ends, ASTs have side plates, records on USTs, double walled frac tanks, electrical equipment container inspections
- ✓ **Overfill prevention** equipment & alarms (or monitoring) present & operational
- ✓ **Vents open** (to prevent container collapse or over pressurization)
- ✓ Transfer and other **connections**, manways & gaskets **tight & in good condition, leak test**
- ✓ **Proper valve** type, condition, position, and tightness. Butterfly & gate valves may leak, ball valves are tight



Dobbins AST Diesel Overfill

**Remtech Engineers**  
Remediation Specialists

9

## Know your Container



Single Wall Frac with Top Fill & Containment

Double Wall Frac with Containment Pool

Double Ball Valves @ Container & Hose

Fuel Tank with Secondary Containment

**Remtech Engineers**  
Remediation Specialists

10

## Know Potential Container Leak Points



Leaking Pool Containment

Leaking Threaded Plug with Spill Pan

Gravel Wear on Containment Liner

Geotech Fabric Protects Liner

**Remtech Engineers**  
Remediation Specialists

11

## Container Checks, cont.

- ✓ **Ball valves between hoses and container connections** to prevent spills and allow hose draining. May use pneumatic hose blow off fittings. Quick connects with end caps
- ✓ Gaskets, camlocks and flanges tight, **gaskets present, not worn** or compressed
- ✓ **Check valve** to prevent backflow from fill container
- ✓ **Secondary containment** present and not leaking
- ✓ **Fill and empty container from top** not bottom when possible
- ✓ **Emergency shutdown** procedures
- ✓ **Grounding/bonding**
- ✓ **Temporary containers - wheel chocks**



Double Valve with Pneumatic Purge

**Remtech Engineers**  
Remediation Specialists

12

## Manway Checks

- ✓ Check manways under liquid level
- ✓ Hinges tight & lids line up with container manway seat
- ✓ Gasket present & in good condition, no debris, clean or replace if necessary
- ✓ Tighten manway bolts
- ✓ Monitor during filling. Manways are generally higher than initial liquid levels. Stop filling if leak develops



Remtech Engineers  
Remediation Specialists

13

## Hose Checks

- ✓ 150 psi+ Buna or XLPE reinforced chemical hose with camlock/hose connections (bands - not alligator clamps, 2 bands per fitting), no threaded connections
- ✓ Integrity/leak test documentation
- ✓ Hoses clean and clear of foreign material
- ✓ Proper size for pump rating and container connections, downsizing hoses or connections can cause over pressurization and rupture/leaks
- ✓ Proper hose supports and length
- ✓ Ball valve between container and transfer connection
- ✓ Visual inspection for abrasion, cuts, fitting clamps tight, hose kinks or compressions, leaks



Remtech Engineers  
Remediation Specialists

14

## Hose Connection Checks

- ✓ Metal camlock fittings
- ✓ Buna gaskets present & in good condition. Inspect for swelling, tearing, and compression
- ✓ Camlocks close tightly - generally confirms integrity of connection
- ✓ Camlocks locked in closed position to prevent disconnects from vibration or pressure (quick ties, locking pins, velcro straps)
- ✓ Spill pans under connections



Remtech Engineers  
Remediation Specialists

15

## Pump Checks

- ✓ Leak test, hydrostatic pressure, replace parts as necessary
- ✓ Pump rated for transfer & compatible wetted and non-wetted materials of construction - metal, aluminum, buna
- ✓ Variable speed pump, diaphragm pumps or recirculation line back to container to regulate flowrate
- ✓ Know pump types - diaphragm, gear, centrifugal, self-priming & inspection/maintenance procedures
- ✓ Backup pump & power, setup to allow pump replacement during transfer w/o leaks
- ✓ Clean, no foreign debris, inspect after each use
- ✓ Suction screen & surge suppressor
- ✓ Camlock fittings not leaking, cleanout, prime ports, pump seals/gaskets checked and replaced as necessary
- ✓ Bleed air out of lines prior to transfer
- ✓ Secondary containment under pump



Diaphragm pump



Surge suppressor

Remtech Engineers  
Remediation Specialists

16

## Construction Equipment Checks

- ✓ Use (rental) companies with **good inspection & maintenance records**
- ✓ **Inspect equipment** condition, hydraulic hoses and connections for damage or leaks at gate, **escort** equipment to work area
- ✓ **Operate hydraulics** prior to unloading and check for leaks. Check pressure gauges and fluid levels
- ✓ **Hoses protected** from impact. Shields in place, including bottom shields
- ✓ **Signs of leakage** prior and during operation - Stop
- ✓ **Secondary containment** on temporary fuel tanks, transfer areas, connections in place
- ✓ **Designated motive fueling areas** & controls to prevent spillage
- ✓ **Do not move** equipment if leak develops



**Remtech Engineers**  
Remediation Specialists

17

## Spill Containment Methods

- **Dams**, trenches, test pits, cutoff walls
- **Spill pans**, pails, drums (20 gal & 55 gal), trash cans, overpacks
- **Sorbent** pads, rolls, socks, oil dry, sand, straw bales
- Sorbent & vinyl **boom**
- **Plastic** cover or deflection to containers
- **Drain stops**
- Tankers, vac trucks, bladders
- Engineered secondary containment



Sorbent Boom & Pads



Vinyl Booms



Straw Filtration Barriers



Magnetic Drain Stop

**Remtech Engineers**  
Remediation Specialists

18

## Spill Containment Examples



**Remtech Engineers**  
Remediation Specialists

19

## Spill Containment Examples



20



## Leak Stop Methods

- **Stop leak** if you can do so safely, buddy system
- **Turn off equipment**, stop pressurized leak
- **Direct leak to spill pan**. Bail or pump to containment
- **Plugs**, expansion plugs, inflatable plugs, end caps
- **DC plugs** (sticks, pencils, foam packing materials, cardboard, tapered wood, golf tees)
- **Compression patches**, magnetic, straps & gasket materials
- **Fast set epoxy putty**, ivory soap bars
- **Drums** – turn leak up



Remtech Engineers  
Remediation Specialists

21

## Leak Stop Methods



Gaskets & gasket material, magnetic sheets, oakum, foam plugs, fast setting epoxy putties, sandbags, inflatable & expansion plugs, foam plugs, spare flanges & bolts, pressure relief discs

Remtech Engineers  
Remediation Specialists

22

## Spill Containment Resources

- Local fire department
- Plant spill kits
- Home Depot, Lowes, nursery's, hardware stores (straw bales, peat moss, play sand, plastic, landscape staples, expansion plugs, epoxy putties, clamps, etc.)
- Spill response contractors

Remtech Engineers  
Remediation Specialists

23





### Substation Transformer Explosion

- 7,000 gallon transformer release within 500 feet of a private drinking water well
- Free liquids pumped into all-terrain tankers and sent to an oil recovery facility
- Saturated gravel and soils excavated & residual soil treated insitu with Remtech's HC-2000 bioremediation accelerator w/o disturbing grounding grid
- Monitoring wells tracked plume migration and oil degradation of the mineral oil prior to entering drinking water well


Remtech Engineers  
Remediation Specialists

25

## Transformer Explosion

- 7,000 gallon 230 KVA Transformer
- 300 gallons recovered
- impact area = 10,400 sf
- 280 tons of saturated soil excavated
- Detention basin rebuilt
- Georgia DNR approved 3 applications of HC-2000 w/o sampling



Remtech Engineers  
Remediation Specialists

26

## Spill Prevention Options

- Contract Controls
- Project Management/Operational Controls
- Engineered Controls

Remtech Engineers  
Remediation Specialists

27

## Contract Control Options

Contractual Accountability

- Require contractual **pollution liability insurance** (work with risk management & ER to determine appropriate coverage). Rental companies may not cover equipment oil releases
- Incorporate company policy on reporting and **cleanup liabilities/cost recovery** and associated damage by responsible parties
- **Specify** containers, transfer equipment, rollofs, temporary tanks, drums, pumps, hoses, connections, gaskets, and integrity/leak testing certification of all oil containing equipment
- Require contractors to provide evidence of **spill prevention training** of personnel & spill prevention plan with all work/task areas

Cleanup Accountability

- Cleanups by third parties performed by **OPC approved professionals**
- **Performance sampling** by certified independent testing labs

Remtech Engineers  
Remediation Specialists

28

## Project Management/Operational Control Options

- Add facility specific **spill prevention awareness** orientation to safety training video, Contractor Safety Orientation Handouts
- **Equipment condition checks** at entrance gates and **escort** to work site
- Require contractor **spill prevention** included with site safety plan
  - Site map with drains, containment, and exclusion areas
  - Fueling areas
  - Check points
  - Spill reporting
  - Containment resources
- **First response assets** (containment) on site to keep spill on property and allow time for professionals to arrive on scene

Remtech Engineers  
Remediation Specialists

29

## Project Management/Operational Control Options, cont.

- **Spill deployment plans** for each facility, review to ensure updated to reflect plant upgrades or changes in plant operation
- Table top and **deployment exercises** with regulatory, fire authorities, response contractors
- **SPCC Awareness/Technician Training** required for cleanup, not required if containment can be set without material contact
- Identification of **Fire Department** spill response/containment capabilities and resources
- OPC could **work with other entities** to share response resources



30

## Project Management/Operational Control Options, cont

### Plant spill kit options to contain spills to property

- Sorbent – rolls, socks, sweeps, pads, boom
- Boom & rope, enough for outlet structures
- Oil dry
- Straw bales, stakes
- Plastic – rolls & bags
- Hand tools
- Buckets (1 - gallon, 5 - gallon)
- Drums (20, 55-gallon, poly over packs)
- PPE, rain suits, nitrile chemical boots, hard hat, face shield, nitrile gloves, tyvek coveralls with hoods (plus level D required for plant operations)



Remtech spill kits



31

## Engineered Control Options

### Plant Prevention System Audits & Upgrade Reviews

- **Engineered containment** structures in place
- Secondary **containment for fueling/transfer/storage areas** – ASTs, USTS, OWS, drums
- Yard drainage swales, sewers, drop inlet covers, cutoff valves
- **Containment area capacities** (rain freeboard) and isolation valves
- Containment area drainage to OWS or treatment facilities
- Retention or detention **pond inlet & outlet valves**
- Identification of plant natural or engineered temporary storage areas for spills



Curb Containment



Tanker Loading Rack with Containment



Ethanol Railcar Unloading Rack with Containment



Remtech Automated Pond Valves for EMC



32

## Oil Spill Prevention Basic Principles & Practices

1. **Look** for areas where leaks may occur
2. **Know** what type of oil/fuel may be involved
3. **Expect** a leak to occur & worst case volume
4. Check lists do not always replace **common sense**
5. **Double check** before startups (containment points, containers, hoses, connections, pumps, levels in tanks, manways, vents)
6. **Provide equipment redundancy**
7. **Monitor** during operation
8. **Rapid release identification, notification, and response** to limit impacts
9. **Lessons learned** from each incident, and corrections as necessary



33





24-Hour Emergency Response  
800-377-3648  
770-427-7766



Emergency Response



Environmental Remediation



Industrial Services



Environmental Training



Environmental Consulting



Environmental Products



Case Histories



Publications & Links

Contact Us

[www.remtech-eng.com](http://www.remtech-eng.com)