Effective Incident Investigation with TapRooT®

Per Ohstrom, Vice President
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Blog: www.taproot.com/blog
A Big Small Company

- Head office Knoxville, TN
- Trainers located in many countries and regions
  - 30 year history from start in nuclear power
  - 100,000+ professionals trained
What can TapRooT do?

- Environment, Health and Safety- accidents, near-misses, environmental releases or human errors
- Quality issues

✓ Improve human performance
✓ Understand and reduce equipment related failures
✓ Improve effectiveness and impact of corrective actions

Easy to Use
Consistent results
Systematic, Saves time and money
Reduces Investigator bias
Expert system
Human Performance based

1. Understand what happened, collect data and draw a SnapChart® visual timeline

2. Find out why a problem occurred - determine Causal Factors

3. Work through Root Cause Tree® to find Basic Cause categories

4. Develop Root Causes using the Dictionary

5. Develop fixes with the Corrective Action Helper®

Anything more to learn? If so, continue!
It only takes a second

www.officeclips.com
### TapRooT® 7-Step Major Investigation Process

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<th>Phases</th>
<th>Steps</th>
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- Visual timeline
- Plan, collect data
- Basis for rest of analysis
What Happened?

Events

1. Employee Walks to Car
2. Employee Steps in Pothole
3. Employee Sprains Ankle
4. Another Employee Notifies Security
5. Employee Transported to Emergency Room & Treated

Incident

Conditions

- After Dark
- Hole 4" deep
- Lights Out
- Reported 4 weeks ago
- Work order Submitted
- No action taken
- No work order submitted

- 3 days?

Only proven facts and questions, NO opinions, judgments, names...
Who does what?

- Rigger attempts to free spool
  - Spool springs free striking Rigger on the head
    - Rigger did not leave container before attempting to free spool
      - Company policy does not allow anyone in container during a lift
    - General information: Rigger remained in the containers several times during previous lifts
    - General information: Rigger and Supervisor were in a hurry to complete work before boat arrives
  - Supervisor did not correct Rigger
  - General information: Rigger should not have tried to correct snag until sure that lift was stopped
- Crane Operator completes the lift
- Supervisor checks on Rigger
  - “Undesired action”
    - Policy information: Rigger should have been sent to medical after injury
    - “General information”
      - Rigger leaves job site and walks towards toilets alone
      - “Lack of action”
        - Policy information: Policy requires an escort to medical
Find Causal Factors

“mistake, error, or failure that directly leads to (or causes) an Incident, or fails to mitigate the consequences of the original error”

Indicated by triangle symbol ▲▲

Initiate/Stop/Catch/Mitigate
**Analyze Causal Factors, find Root Causes**

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“The absence of a best practice or the failure to apply knowledge that would have prevented the problem”
Root Cause Tree®

Causal Factor/Issue:

START HERE with each causal factor/issue and select or eliminate each category to find root causes.

- HUMAN PERFORMANCE DIFFICULTY
  - TOLERABLE FAILURE
    - DESIGN SPECS
      - Specs NI
      - Design Not To Specs
    - Problem Not Anticipated
  - DESIGN REVIEW
    - Independent Review NI
      - management of change (moc) NI
      - hazard analysis NI

- EQUIPMENT DIFFICULTY
  - EQUIPMENT / PARTS DEFECTIVE
    - PROCUREMENT
    - MANUFACTURING
    - HANDLING
    - STORAGE
    - QUALITY CONTROL
  - PREVENTIVE / PREDICTIVE MAINTENANCE
    - PM NI
    - No PM for Equip
    - PM for Equip NI
  - REPEAT FAILURE
    - MANAGEMENT SYSTEM
      - Corrective Action
        - corrective action NI
        - corrective action not yet implemented
        - trending NI

- NATURAL DISASTER / SABOTAGE

- OTHER (SPECIFIC)
15 Questions relating to Causal Factor:
- Cross off NO
- Circle YES
- Keep going

Circles point to categories on back of page
Basic Cause Categories

Evaluate for Root Causes

Other categories are eliminated
Example: Finding root causes

- Human - Machine Interface
  - labels NI
  - arrangement/placement
  - displays NI
  - controls NI
  - monitoring alertness NI
  - plant/unit differences
  - excessive lifting/force
  - tools/instruments NI

- Work Environment
  - housekeeping
    - NI
    - hot/cold
    - wet/dry
    - lights NI
  - noise
  - obstruction
  - cramped quarters
  - equipment guard NI
  - high radiation/contamination

- Complex System
  - knowledge-based decision required
  - monitoring too many items

- Non-Fault Tolerant System
  - errors not detectable
  - errors not recoverable

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# Develop fixes

## Corrective Action Helper®:
- Suggestions
- References

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What are good Corrective Actions?

STRONGEST

1. REMOVE / REDUCE THE HAZARD
2. REMOVE THE TARGET
3. GUARD THE TARGET
4. IMPROVE HUMAN PERFORMANCE with good Human Factors Design
5. IMPROVE HUMAN PERFORMANCE with Rules, Procedures, Signs…
6. IMPROVE HUMAN PERFORMANCE with Training, Supervision, Discipline…

WEAKEST
1. Your knowledge can get in the way of a good root cause analysis
2. Interviews are NOT about asking questions
3. Trending helps you get better
1. Your knowledge can get in the way

- You must know cause and effect relationship to find the root causes
- Inexperienced Investigator Trap:
  - Don’t know all the potential causes (maybe only one!)
- Experienced Investigator Traps:
  - No Psychology / Human Factors Knowledge
  - Favorite-Cause-itis
2. Interviews are NOT about asking questions

• Stimulate memories and collect best possible information

• Cognitive Interviewing Techniques
  – Use the SnapChart®
  – Ask to explain in own words
  – Ask “how” and ‘what”, not “why”
  – Listen, don’t interrupt
  – Ask for ANY important info they can share…
3. Why Trend?

- Spot bigger, underlying issues
- Prove routine variation is NOT a trend
- See impact of improvement over time
Why does TapRooT® work?

Other Methods

• “Easier to use and do not limit thinking when looking for root causes”
  – Cause-and-effect
  – Fishbone analysis
  – 5-Whys

• Software programs
  – Timeline of events?
  – Jump straight to “root cause”
  – No support for corrective action development

TapRooT®

• Not depending on investigator expertise like deductive reasoning methods
• Less confirmation bias
• TapRooT® provides structure for use by non-experts:
  – Focus on human error
  – Thorough information collection
  – More than one root cause
  – More efficient problem solving
  – Consistent results enable trending over time
Public and On-site Training:
- 2-Day TapRooT® Root Cause Analysis
- 5-Day TapRooT® Advanced Root Cause Analysis Team Leader
- 3-Day TapRooT®/Equifactor® Equipment Troubleshooting and Root Cause Failure Analysis

TapRooT® VI Software
- Multi-User Corporate License
- Single user SaaS subscription

Consulting
- Complex or high stakes investigations
- TapRooT® implementation