

# Study of Electronic Work Permit System in Oil and Gas Industry – Kuwait

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## Abstract

A permit-to-work is a document which specifies the task to be performed, associated foreseeable hazards and the safety measures. The permit-to-work system has been widely used to ensure safety during maintenance and/or construction activities in almost every major hazard industry worldwide.

Effective implementation of a comprehensive permitting program certainly helps preventing several undesirable incidents. However, deficiencies in implementing a permit-to-work system have been a contributing factor in several catastrophic incidents. Major hazard industries especially oil and gas operators are putting considerable efforts to ensure safe operations thereby protecting health and safety of workforce and the environment.

Among several initiatives the permit-to-work system has been a key tool to manage work safety in the industries. The 21st century advancement in computing invented electronic solution for managing permits and risk associated with maintenance and construction activities. Induction of e-permits created a debate on effectiveness of the electronic system.

**Keywords:** Electronic Permitting System, Color coded certificates, Engica Technology, Electronic Dashboard, E-Permit

## 1. Introduction

The Major hazard industries especially oil and gas operators are putting considerable efforts to ensure safe operations thereby protecting health and safety of workforce and the environment.

Among several initiatives the permit-to-work system has been a key tool to manage work safety in the industries. The 21st century advancement in computing invented electronic solution for managing permits and risk associated with maintenance and construction activities. Induction of e-permits created a debate on effectiveness of the electronic system.

The first electronic permit-to-work system was designed in early 1990s. Transition from paper based system to electronic permitting was led by the petrochemical sector in UK. A number of major oil industry operators in the North Sea and the Middle East are currently using in one or another form of the electronic permit-to-work system. The digital solution to the paper based permit-to-work system offers a combination of amazing features including work order integration, risk assessment, isolation of hazardous energy, competency management, lessons learned sharing, and continual improvement etc. The format and content of the paper permits can be adopted in the electronic system.

This system is a unique electronic Permission to Work software system which ensures your work authorization processes not

only comply with all Oil & Gas Industry regulations and Government legislation but also protects your assets and everyone who has a reason to touch your business.

## 2. Why change to an Electronic Permit to Work System

A permit-to-work is a document which specifies the task to be performed, associated foreseeable hazards and the safety measures. The permit-to-work system has been widely used to ensure safety during maintenance and/or construction activities in almost every major hazard industry worldwide. It is a part of inclusive risk management program aimed to avoid incidents that could result in undesirable consequences such as injury to personnel, harm to the environment, damage to physical assets, or disruption of operations. Effective implementation of a comprehensive permitting program certainly helps preventing several undesirable incidents. However, deficiencies in implementing a permit-to-work system have been a contributing factor in several catastrophic incidents, including the Piper Alpha disaster in 1988. A HSE survey in UK showed that a third of all accidents in the chemical industry were maintenance-related, the largest single cause being a lack of, or deficiency in, permit-to-work systems.

Regulatory authorities in several countries require permit-to-work system; a few examples are Occupational Safety & Health Administration (OSHA, USA) 29 CFR: 1910.146 - Permit-Required Confined Spaces, 1910.147 – The control of hazardous energy (lockout/tag-out), CFR 1910.1200 HAZCOM, 29 CFR 1910.119 Process Safety Management (PSM), ANSI/ASSE Z117.1-2009 Safety Requirements for Confined Spaces etc.

Major steps involve in the permit system include identify tasks require permit(s), develop permit forms, define roles, train and maintain competency of personnel, create work order, fill out permit forms, identify associated hazards and mitigation, execute the task within the constrained listed on the permit and adhering to specified safety measures, closeout permit, review and monitoring. Main aspects generally considered for permit-to-work system are as follows:

- Complexity of the operation including risk involved
- Human factors including personnel skills
- Types of permits required and content of each permit

## 3. Paper Based Vs Electronic PTW System

Paper-based permit-to-work system, where pre-printed permit forms are filled and signed off by authorized persons as approval

Features	Paper Based System	Electronic Permit System
Flexibility of designing permit format and contents	Yes	Yes
Printed hard copy available at worksite	Yes	Yes
Easy access to all permits for reference and review from each users' PC/desk	No	Yes
Visibility of all work locations at a glance on screen	No	Yes
Ensure compliance with authorization roles	No	Yes
Ensure compliance with each permitting process steps	No	Yes
Creating, review and approve permits without any person physically chasing responsible parties	No	Yes
Ensure JHA and risk assessment prior to issue any permit	No	Yes
Easy tracing of permits for review and audits	No	Yes
Instantly identifying conflicts between permits and SIMOPS	No	Yes
Ensure required fields are completed and readable	No	Yes
Retrieving details of isolation points	No	Yes
Quick access to live and expired/closed permits and JHAs	No	Yes
Job Hazard Analysis and risk assessment integration	No	Yes
Real time instant monitoring of active work locations	No	Yes
Computerized Maintenance Management System Work Orders and Permit integration	No	Yes
Easy scalability to other operations	Yes	Yes (additional cost)
No adverse effects in case of major power breakdown and server failure	Yes	No
No impact in case of E-permit software malfunction	No	Yes
Remote permit access and monitoring	No	Yes
Multiple languages functionality	Yes	Limited
Ensure competency based roles assignment	No	Yes
Pre-populated Hazard Tree	No	Yes
Record and easily accessible lessons learned	No	Yes

to commence the job at site, is a common practice in petroleum industries. Advancement in technology invented electronic solution for permit-to-work system. Key features typically built-in and possible through the electronic permitting systems but

difficult to realize with paper based system are summarized in Table - 1

**Table-1**

Each document created in the Electronic Permit to Work System will have a unique number. A typical permit-to-work documents, their relationship, and high level process flow is shown in Diagram-1.

#### 4. List of few major organizations using Electronic PTW System

- ✓ Chevron
- ✓ Marathon Oil
- ✓ British Petroleum
- ✓ Qatar Gas
- ✓ EQUATE
- ✓ Kuwait Oil Company
- ✓ Johnson & Johnson
- ✓ Saudi Aramco
- ✓ Royal Air force
- ✓ Rolls Royce
- ✓ General Electric
- ✓ ALSTOM
- ✓ Petronas
- ✓ Abu Dhabi Oil Company

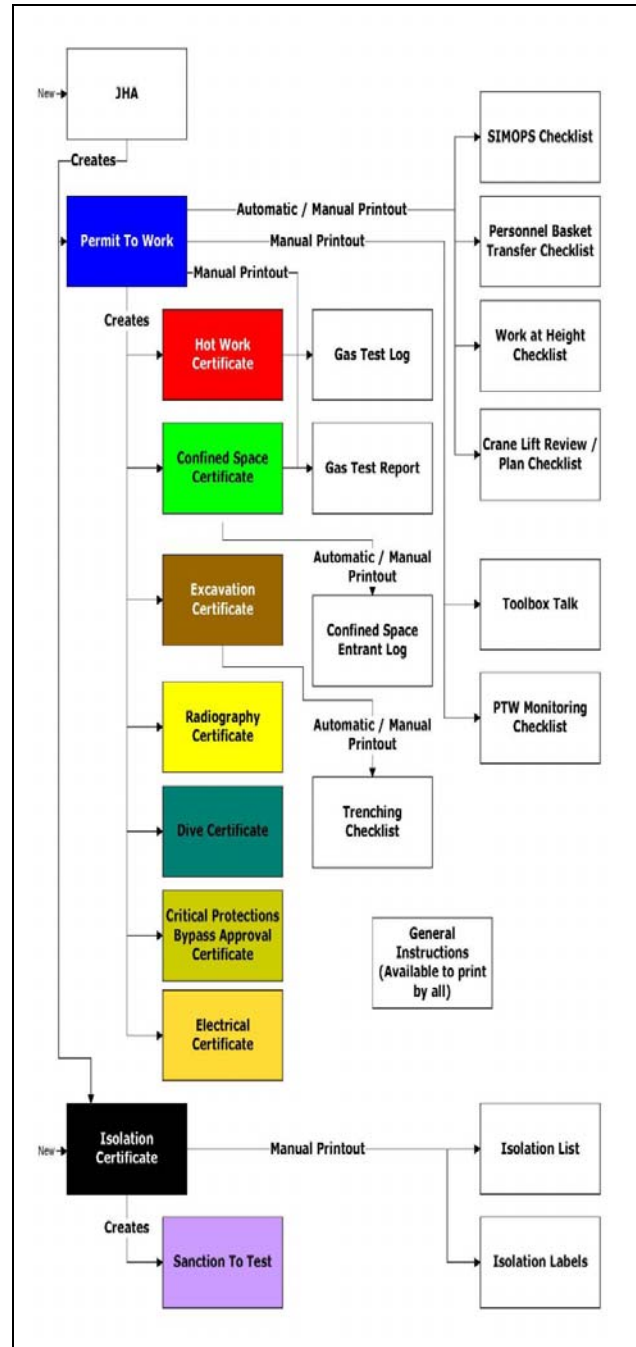
#### 5. Documents available in Electronic PTW System

- ✓ Risk Assessment / Job Safety Analysis
- ✓ Permit To Work
- ✓ Hot Work Permit
- ✓ Confined Space Entry Permit
- ✓ Excavation Permit
- ✓ Isolation Permit
- ✓ Sanction To Test Permit
- ✓ Bypassing Critical Protections Permit
- ✓ Energized Electrical Work Permit
- ✓ Radiography Permit
- ✓ Dive Permit
- ✓ Vehicle Entry Permit

The System will allow the organization to have any number of permits depending on the needs.

Just as in paper based permit system, each permit documents listed above can be distinctly color coded. Color coding will enable easy identification of the documents by the workers at the job sites.

Diagram-1.



## 6. Electronic Permit to Work System Implementation

Key project stages are outlined as follows:-

- ✓ Project Initiation
  - Internal Project Preparation
  - Client Workshop Meetings
  - Process Mapping and Specification Documentation
- ✓ Preparation
  - System Configuration and Integration
  - Training Material Assembly
  - Client Process System Documentation Assembly
  - Test Data and Test Script
  - In house tests and performance verification
- ✓ Acceptance
  - Site Installation and Acceptance
- ✓ Training
  - Training System Setup and Site Training
- ✓ Go-Live and Support
  - Go-Live and on-going support

## 7. Cost Impacts

Electronic Permit to Work is a customized system and cost is dependent. The cost of implementing the Electronic Permit to Work System depends on each customer's requirements and needs.

Some of the major costs in implementing the system include

- Software cost - Number of software licenses required
- Hardware cost – Server, PC and Printer
- Cost of dedicated resources depending on the size of the organization
- Training cost
- Annual Support and Maintenance cost
- Upgrade and modification cost
- Other optional costs include LED screens, portable hand-held devices, Etc.

The cost of implementing the Electronic Permit to Work System may vary from 0.5 Million US Dollars to 5 Million US Dollars depending on the size and requirements of the organization.

## 8. Challenges

Leaders in some organizations may be reluctant adopting electronic permit-to-work system; this might be mainly due to the high initial cost, annual software support and maintenance cost, past unpleasant experiences with other safety software, and also feeling that this might discourage field visits and likelihood of personnel sticking to computers.

Selecting a well-established permit-to-work software provider and also maintaining a service agreement help uninterrupted performance of the electronic permit to work system and troubleshooting glitches. Hard copy of permit should be signed by the permit approver and the work team leader at worksite after reviewing the site conditions and conducting onsite job safety analysis enabling interaction and onsite verification.

A dedicated team comprising of safety, operation, IT and the e-permit software vendor personnel is very useful from early planning stage through procuring hardware, designing the forms, mapping the process flow, developing and launching training, field testing, trouble shooting and finally successfully running the permit-to-work system.

Majority of the e-Permit vendors claim cost reduction by adopting their product. However, organizations did not find any significant direct cost reduction by using the electronic permit system. It might be due to stringent requirements such as maximum one day validity of permit that requires printing of permits every day. Printing ink consumption costs more than bulk pre-printed forms used in paper based system. Even minor modification in the permit content and/or process flow requires software modification resulting in additional cost every time. Paper based system is required as standby in case of e-permit software breakdown.

## 9. Acknowledgement

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## 10. Conclusion

The electronic permit-to-work system with dashboard display on large LED screens at key locations result in improved permit-to-work administration, quality of job hazard analysis and risk mitigation, authorization rigor, HES competency management, training new person, search and access historical data, monitoring (inspection/audit/review), emergency response etc, thereby supporting work safety.

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