



**DEPARTMENT OF PETROLEUM RESOURCES**  
7, KOFO ABAYOMI STREET VICTORIA ISLAND  
LAGOS

Applicable to all Operators  
Upstream and Downstream

**GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK  
ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY**


**ORIG DEPT: Technical  
Services**

# **GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK BASED INSPECTIONS IN THE NIGERIAN PETROLEUM INDUSTRY**

*ISSUED BY*

**THE DEPARTMENT OF PETROLEUM RESOURCES  
2006**

TBI	JAN 06	ISSUE FOR COMMENT	A SARKI	G. E. Nwachukwu	D.O. Irrechuckwu	A.O. Chukwueke
<b>Rev.</b>	<b>Date</b>	<b>Description</b>	<b>Prepared</b>	<b>Reviewed</b>	<b>Checked</b>	<b>Approved</b>

	<p style="text-align: center;"><b>DEPARTMENT OF PETROLEUM RESOURCES</b>  <b>7, KOFO ABAYOMI STREET VICTORIA ISLAND</b>  <b>LAGOS</b></p>	<p>Applicable to all Operators  Upstream and Downstream</p>
	<p style="text-align: center;"><b>GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK  ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY</b></p>	<p><b>ORIG DEPT: Technical  Services</b></p>

## **SECTION 1**

### SCOPE

The present guidelines are applicable to planning, implementation and use of risk analysis in the petroleum industry activities (facility development/modification, operation and maintenance) with reference to provisions of the Mineral Oils Safety Regulation MOSR 1997, Procedure Guide for Design Construction and Maintenance of fixed offshore platforms, Guidelines and Procedures for the Construction and Maintenance of Oil and Gas Pipeline and their Ancillary Facilities. The scope must include Zero-state inspections and the result must demonstrate programme compliance with this document.

## **SECTION 2**

### PURPOSE

The guideline stipulates provisions concerning risk analyses.

Risk analyses are a means to identify focal areas in order to meet the acceptance criteria for risk and to enhance the safety level in the activities.


Risk analysis provide knowledge concerning risk connected with the activities and constitute a basis for the decision-making process so as to plan and implement the activities **in accordance with the intent of applicable legislation and with the operators own safety requirements.**

The guideline must be seen in conjunction with the underlying detailed provisions containing functional and result oriented requirement to safety as well as to limited risk analysis within particular areas of facility development, modification, operations and maintenance activities.

The guidelines is to ensure that analysis programme be applied correctly, based on sound judgments and principles such that its economic and operational benefit is realized together with enhanced safety.

For any deviation from stipulated acceptance criteria, risk-reducing measures must be implemented.

The results from the analysis should be used in preventive and curative safety measures.

	<p align="center"><b>DEPARTMENT OF PETROLEUM RESOURCES</b>  <b>7, KOFO ABAYOMI STREET VICTORIA ISLAND</b>  <b>LAGOS</b></p>	<p>Applicable to all Operators  Upstream and Downstream</p>
	<p align="center"><b>GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK  ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY</b></p>	<p><b>ORIG DEPT: Technical  Services</b></p>

### **SECTION 3**

#### APPLICATION AND LIMITATION

For the risk analysis to be accepted, the operator or his representative must be an owner-user with an international certification of authorization and validate the certificate with DPR.

### **SECTION 4**

#### DOCUMENTATION

Operator(s) intending to use risk analysis in facility development and/or modification projects, preventive maintenance programme, and general safety inspection/audit should submit an application to DPR for the same purpose.


The following documentation will also be required:

- i. An account of the measures, which are or will be, carried out as a result of these analyses.
- ii. Description of risk analysis to be carried out or updated during the phase of the activities to which the consent is applicable.
- iii. The plan for the risk analysis to be carried out for the phase in question should indicate when the risk analysis are to be carried out, their scope and the purpose of carrying them out.

Risk analysis with reference to MOSR 1997 may be used to document compliance with requirements especially when mobile installations and vessels are being considered.

Documentation with all factors contributing to the final risk assessment must include but not limited to the following:-

- ✓ Team members performing the assessments and their qualifications
- ✓ Reassessment interval
- ✓ Factors used to determine risk
- ✓ Assumptions made during assessment
- ✓ Risk assessment results (unmitigated risk level)

	<b>DEPARTMENT OF PETROLEUM RESOURCES</b> <b>7, KOFO ABAYOMI STREET VICTORIA ISLAND</b> <b>LAGOS</b>	Applicable to all Operators Upstream and Downstream
	<b>GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK</b> <b>ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY</b>	<b>ORIG DEPT: Technical</b> <b>Services</b>

- ✓ Follow up mitigation strategy
- ✓ Mitigated risk level

**Documentation of the administrative system established by the operator to meet the requirements of risk analysis carried out shall be submitted to DPR for approval.**

In addition to the above documentation an operator wanting to implement risk analysis programme must have the resources and structure to make such programme work. This shall include having the ongoing involvement of experienced corrosion, materials, maintenance and process engineers/technologist.

If an operator proposes to contract some or all of the above capability to a vendor, then this shall have to be reviewed by DPR on a case-by-case basis.

DPR shall be informed if the operator alters the safety objectives and the acceptance criteria for risk in petroleum activities.

## **SECTION 5**

### **SAFETY OBJECTIVES FOR THE ACTIVITIES**

Operator(s) using risk analysis shall define safety objective for his activities i.e. facility development/modification projects, preventive maintenance or safety inspection/audit.


To ensure that the planning, maintaining and enhancement of safety in the activities becomes a dynamic and forward-looking process, the operator shall express his safety objective as an ideal safety level.

The safety objectives shall reflect the requirement of all applicable regulations with regards to safety of people, assets, the environment and cost.

Depending on the activity, the operator's safety objectives may be expressed as long-term and short-term objectives.

Safety objective shall be used to initiate preventive safety measures based on knowledge obtained through a risk analysis.

This shall be use for enhancement of safety in the activities and shall form the basis for revision of the operators' acceptance criteria.

	<b>DEPARTMENT OF PETROLEUM RESOURCES</b> <b>7, KOFO ABAYOMI STREET VICTORIA ISLAND</b> <b>LAGOS</b>	Applicable to all Operators Upstream and Downstream
	<b>GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK</b> <b>ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY</b>	<b>ORIG DEPT: Technical</b> <b>Services</b>

## SECTION 6

### DEFINITION OF ACCEPTANCE CRITERIA (AC)

The AC express the level of risk deemed acceptable by the operators for a given period or phase of the activities.

It expresses a standpoint with regard to risk connected to loss of lives, injury, property damage, production down time and damage to the environment.

It must reflect the safety objectives and peculiar characteristics of the activities.

The following shall form the basis for defining AC

- i. Safety legislation.
- ii. Recognized industry standards.
- iii. Applicable risk reduction measures.
- iv. Prior knowledge of accidental events and their effects.
- v. Experience and sound engineering judgment.

Limits for **Quantitative Acceptance Criteria** shall be clearly defined for their application and all data used shall be documented.


Due to uncertainty in expressing risk in quantitative terms, the way quantitative AC are to be used shall be specified.

Similarly, conditions for **Qualitative Acceptance Criteria** shall be defined.

The operator is expected to revise the AC overtime in order to take account inter alia experience, new information, possible changes in the activities and technological advancement and send same to DPR for approval.

Furthermore, the achievement of safety objectives may entail an actual reduction of risk in the activities, and thus provide basis for a revised definition of acceptance criteria.

The requirement with regards to revision of the acceptance criteria for risk applicable to the activities must be seen in connection with the purpose of the safety regulations with regards to enhancing the level of safety in the activities.

	<p align="center"><b>DEPARTMENT OF PETROLEUM RESOURCES</b>  <b>7, KOFO ABAYOMI STREET VICTORIA ISLAND</b>  <b>LAGOS</b></p>	<p>Applicable to all Operators  Upstream and Downstream</p>
	<p align="center"><b>GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK  ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY</b></p>	<p><b>ORIG DEPT: Technical  Services</b></p>

The revision may have consequential effect on those accidental events that were not originally classified as dimensioning accidental event to be classified as such, in the subsequent risk analysis.

## **SECTION 7**

### **GENERAL REQUIREMENT TO RISK ANALYSIS (RA)**

1. RA shall be result oriented and systematic.
2. It shall provide basis for qualitative decision-making process that assist in selecting risk reduction measures.
3. It shall demonstrate avoidance of accident and ensure that risk level remain As Low As Reasonably Practical (ALARP) in accordance with the industry standards..

## **SECTION 8**


### **1. BASIC REQUIRMENTS**

*The following addresses the minimum requirement that must be met for a risk analysis to be accepted.*

#### **1.1 Procedure documentation**

- i) The risk analysis process must be clearly documented in a written procedure. This procedure must be a referenced and controlled document under Owner-User quality manual*
- ii) Detailed definition of the procedure must be given throughout the process. The procedure must detail how hazards are defined for each equipment and how likelihood and consequences of failure are established, and how this is used to determine level and inspection frequencies.*

The procedure shall be audited and reviewed by operator together with DPR

	<b>DEPARTMENT OF PETROLEUM RESOURCES</b> <b>7, KOFO ABAYOMI STREET VICTORIA ISLAND</b> <b>LAGOS</b>	Applicable to all Operators Upstream and Downstream
	<b>GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK</b> <b>ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY</b>	<b>ORIG DEPT: Technical</b> <b>Services</b>

## 1.2 Personnel


- i) *At minimum, operations, maintenance, inspection and process personnel, experienced with the equipment under consideration must be included in the consequences and likelihood assessment stages.*
- ii) *A corrosion specialist with sufficient qualification and experience to understand the process, predict failure mechanisms and identify limitations in inspection techniques must be involved in the entire risk assessment.*
- iii) *The role of DPR in the process must be clearly defined.*
- iv) *The impact of the personnel changes on the risk analysis programme must be managed and controlled to ensure continued competency.*
- v) *All personnel participating in the risk analysis programme must be fully trained in the programme to understand the implication of the decision made. The training must be documented.*

## 1.3 Zero State Inspection

*The zero state inspection must be an integral part of the written risk analysis procedure. It is critical that a risk assessment is made at this time and that appropriate mitigation and inspection intervals are set. The programme must address how specific challenges (such as a lack of historical operating data) are to be addressed.*

## 1.4 Management Of Change

*Management of change must be controlled by a written procedure that is referenced in the owner-user quality manual. The process by which the impact of changes identified is reviewed under the risk analysis programme must be audited during the owner user audit by a third party.*

	<b>DEPARTMENT OF PETROLEUM RESOURCES</b> <b>7, KOFO ABAYOMI STREET VICTORIA ISLAND</b> <b>LAGOS</b>	Applicable to all Operators Upstream and Downstream
	<b>GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK</b> <b>ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY</b>	<b>ORIG DEPT: Technical</b> <b>Services</b>

## **SECTION 9**

### **PLANNING AND IMPLEMENTATION OF RA**

RA should be an integral part of the design of development concept, operations and maintenance.

RA should be implemented in major modifications, major changes in operations and decommissioning.

The following shall be classified before RA is carried out.


- i. Scope of the analysis.
- ii. Purpose in accordance with the identified needs as well as target groups for the result of the analysis.
- iii. Acceptance criteria for risk in the activities.
- iv. Database adapted (local, national, international) and what experience (internal external) relevant e.g. corrosion models, degradation models etc.
- v. Assessment and acceptance of assumptions on which the analysis to based upon. This is necessary for the results of the analysis to be interpreted correctly and can be implemented more easily in the operational phase.
- vi. Competence of the analyst(s) evaluating the risk analysis.
- vii. Ensuring that the **analytical model** and/or **computer programme** employed are suitable and meet the requirements of the operator with respect to data, materials, assumptions, etc.
- viii. From the result, the decision makers should be able to form an accurate and comprehensive opinion. The result shall be a working tool for all target groups.

## **SECTION 10**

### **DELIVERABLES OF RISK ANALYSIS**

Results from risk analysis can be used to select technical, operational and organizational risk reducing measures for the activities.



	<b>DEPARTMENT OF PETROLEUM RESOURCES</b> <b>7, KOFO ABAYOMI STREET VICTORIA ISLAND</b> <b>LAGOS</b>	Applicable to all Operators Upstream and Downstream
	<b>GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK</b> <b>ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY</b>	<b>ORIG DEPT: Technical</b> <b>Services</b>

Risk analysis with associated assessment are required to be actively used in preventive safety work, including information to employees, motivation campaign, training programme system audits etc.

For alternative risk reduction measures, it is expected that interdependence between them be clearly pointed out. The choice of risk reducing measures shall be based on an evaluation of the effect that the measures that are implemented as a result of risk analysis are described in section 9 of these guidelines.

The accidental events that were not originally classified, as dimensioning should be used in the operator's effort to meet safety objectives defined for the activities.

## **SECTION 11**

### **UPDATING OF RISK ANALYSIS**


The basis for the analysis should be updated to follow the progress of the activities in order to identify any need for reducing measures or new focal areas for safety work.

The purpose of updating risk analysis previously carried out is to established a coherent basis for the administration of safety work in the activities and to ensure that risk analysis bearing the same type of problem are made comparable.

**For updating any risk analysis, documentation shall be submitted to DPR as described in Section 3 of this regulation.**

An update of risk analysis should include: -

- i. Updating of the characteristics of the object of analysis to follow the progress of activities.
- ii. Updating and extension of basic assumptions made for the previous analysis.
- iii. Updating of the data material to include new experience, new knowledge or changes in data basis that are used.
- iv. Updating of method applied.
- v. Updating of the results of analysis in the view of any changes in the acceptance criteria for risk established by operator and ratified by DPR for the activities.

	<b>DEPARTMENT OF PETROLEUM RESOURCES</b> <b>7, KOFO ABAYOMI STREET VICTORIA ISLAND</b> <b>LAGOS</b>	Applicable to all Operators Upstream and Downstream
	<b>GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK</b> <b>ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY</b>	<b>ORIG DEPT: Technical</b> <b>Services</b>

It should be noted that all relevant information be transferred to future risk analysis.

Risk analysis shall be updated on the basis of:

- i. Experience gained from accidental event.
- ii. Organizational changes.
- iii. Changes in legislation.

## **SECTION 12**

### **RISK REDUCING MEASURES**

Attempt must be made as far as possible to eliminate or reduce individual risk identified through a risk analysis if not all the risk. All probable causes of an accidental event must also be removed.

There is an obligation to implement risk-reducing measures directed at each defined dimensioning accidental event, in order to meet the acceptance criteria for risk in the activities.

Risk reducing measures may be of **technical, operational** and/or **organizational** nature.

In selecting the type of measure, an overall assessment of the effect the measures have on risk shall be decisive through application of the risk reducing measures selected.


**Technical risk reducing measures** will apply to the design, conceptual solutions, and load bearing structures, equipments location and active or passive fire protection.

**Operational risk reducing measures** will apply to procedures relating to operations, maintenance, supervision and communication.

**Organizational risk reducing measures** will apply to the organizational structure, distribution of responsibility, and delegation of authority to make decisions, established line of communication, manning and training.

Probability reducing measures are required to be given priority over consequence reducing measures whenever possible.

The purpose of such priority is as far as possible to adapt the design and equipment of the installation to the personnel and to prevent that personnel exposing to accidental loads.

	<b>DEPARTMENT OF PETROLEUM RESOURCES</b> <b>7, KOFO ABAYOMI STREET VICTORIA ISLAND</b> <b>LAGOS</b>	Applicable to all Operators Upstream and Downstream
	<b>GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK</b> <b>ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY</b>	<b>ORIG DEPT: Technical</b> <b>Services</b>

The choice of risk reducing measure should be based on available technology relevant phase of activities and past evaluations.

When risk analyses are used for existing facilities, risk-reducing measure may compensate for the limited possibilities that exist for implementing major technical risk reducing measures.

## SECTION 13

### DEFINITION

**Risk:** Expression of the probability and the consequences of an accidental event.

**Accidental Event:** Event or condition which maybe of consequences to people, environment and for assets.


**Risk Analysis:** Comprehensive (Qualitative and Quantitative) analysis and systematic identification and categorization of risk in technical, operational, human and/or organizational structure of petroleum activities industry.

**Acceptance Criteria:** Qualitative and/or Quantitative expression used to determine whether an accidental event is within acceptable risk.

**Dimensioning Accidental Criteria:** An unacceptable risk according to the operators acceptance criteria that should be taken into account in design, construction and when planning the organizational structure in order to meet the established acceptance criteria.

**Safety Case:** A document designed to:

- ⇒ Give the regulator confidence that the operator has the ability, commitment and resources to properly assess and effectively control health and safety risks;
- ⇒ Provide a working document against which the operator and regulator can check that the accepted risk control measures and safety management systems have been properly put into place and continue to operate in the way in which they are intended.

	<b>DEPARTMENT OF PETROLEUM RESOURCES</b> <b>7, KOFO ABAYOMI STREET VICTORIA ISLAND</b> <b>LAGOS</b>	Applicable to all Operators Upstream and Downstream
	<b>GUIDELINES CONCERNING IMPLEMENTATION AND USE OF RISK</b> <b>ANALYSIS IN NIGERIAN PETROLEUM INDUSTRY</b>	<b>ORIG DEPT: Technical</b> <b>Services</b>

## REFERENCES

1. Regulation concerning implementation and use of risk analysis in the petroleum activities with guidelines *NOWEGIAN PETROLEUM DIRECTORATE 1990*.
2. ABSA Risk Based Inspection for Pressure Equipment Revision 0, 2001.
3. API 580- Recommended Practice- Risk Based Inspection.
4. API 572- Inspection of Pressure Vessels.