

# **A Comprehensive Review and Analysis of Maturity Model for Well Integrity in Brownfield**

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# Outlines

- Introduction
- Journey of Well Integrity Maturity
- Application of maturity models
- Conclusions and recommendations

# Introduction

Well Integrity Management System (WIMS) is simply a process, in which, integrity of wells is continually managed, assessed, and verified. This is repeated for all life cycles of the well

- Ensure all teams have the same trusted information of Well Integrity.
- Reduce overload of data and concentrate only on the information required to take critical decisions.
- Decrease overall assessment time.
- Simplify early detection of Well Integrity impairments
- Offer easier way to analyze and diagnose the root cause of any failure

# Journey of Well Integrity Maturity

Program Initiation: program started in 2005 with aging well stock

- Well Integrity Policy

Help to improve WIM through formal processes and application of good technical practices

- Well Integrity Organization Capability

Specific WI responsibilities were written for each position (RACI Chart)

- Risk Ranking of Wells

all wells were mapped to safety matrix and risk distribution of all wells defined

- Well Integrity Management Assurance

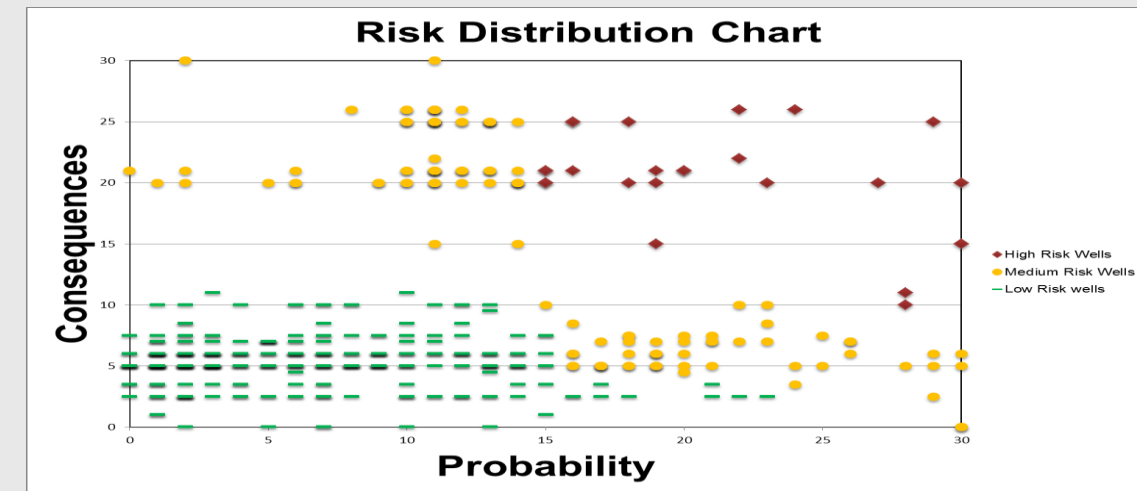
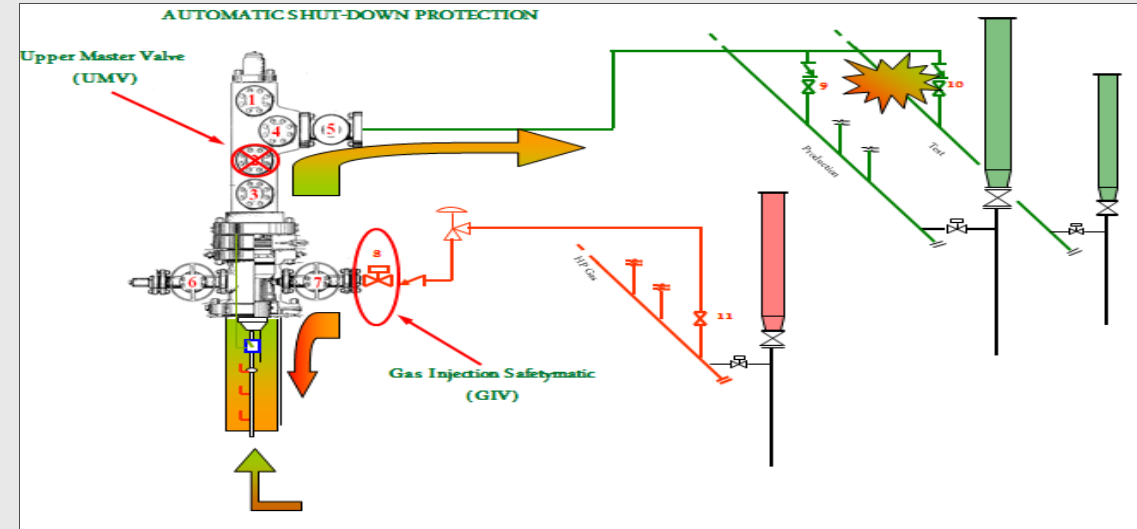
Senior management decided to support and mature WIMS

# Journey of Well Integrity Maturity

WELL INTEGRITY RACI CHART

	Operations General Manager	Drilling General Mgr	Engineering General Mgr	Drilling Operations General Mgr	Drilling Engineering General Mgr	Drilling Team Leader	Well Integrity Team Leader	Field General Manager	Production Manager	Production Technology Manager	Well Integrity Engineer	Production Supervisor	Production Operator	Wellhead Supervisor	Wire Line Supervisor
Intervention Procedures															
Develop individual intervention procedures	A	C	C	R	C	C	I	C	I	I	I	I	I	I	C
Risk Assessment	I	I	I	I	I	C	I	C	C	R	I	I	I	I	I
Wireline (slickline) procedures	I	I	I	I	I	I	I	A	R	C	I	I	I	I	C
E-line procedures	A	I	C	I	I	I	I	C	C	R	C	I	I	I	C
Coiled Tubing Procedures	A	R	C	C	I	I	I	C	C	C	I	I	I	I	I
General Pumping Procedures	I	I	I	I	I	I	A	C	R	C	I	I	I	I	I
Well Killing & Securing	A	C	R	I	I	C	I	C	C	C	I	I	I	I	C
Tubing / Casing Annulus Integrity															
Define Maximum Safe Pressure Limits	A	R	I	C	C	C	C	I	I	I	I	I	I	I	I
Develop Operating Procedures	I	I	I	I	I	I	C	A	R	R	C	I	I	I	I
Develop Diagnostic Procedures	I	C	C	C	C	C	C	A	C	C	R	I	I	C	C
Annulus pressure monitoring	I	I	I	I	I	I	C	A	R	C	C	C	R	R	R
Maintain pressure records	I	I	I	I	I	I	I	A	C	R	R	R	R	R	R
Initiate Risk Review on problem wells	I	R	C	R	I	I	C	C	R	R	R	I	I	C	C
Xmas Tree Integrity															
X-tree valve maintenance and testing	I	I	I	I	I	I	C	I	R	C	C	C	C	R	I
X-tree test result documentation	I	I	I	I	I	I	I	R	I	I	C	C	R	I	I
Maintain testing records	I	I	I	I	I	I	I	A	C	C	R	I	I	R	I
X-tree valve repairs	I	I	I	I	I	I	I	A	C	C	R	C	I	R	I
SSSV Integrity															
Monitor control line pressures	I	I	I	I	I	I	I	R	I	I	C	C	I	R	I
SSSV testing schedule compliance	I	I	I	I	I	I	I	R	C	C	C	C	I	R	I
Test result documentation	I	I	I	I	I	I	I	R	I	I	C	C	I	R	I

Accountable **A** The line manager with the budget and authority to deliver Well Integrity  
 Responsible **R** Person(s) who monitor or supervise activities / operations to deliver Well Integrity  
 Consult **C** Two-way communication, must occur before decision is made; includes sign-off.  
 Inform **I** One-way communication, may occur after the decision is made



# Journey of Well Integrity Maturity

## Well Integrity Management System Embedding

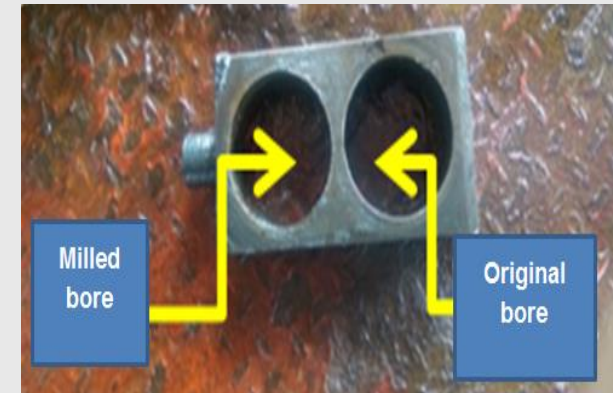
- Reducing number of High Risk Wells
- Developing watch list for wells that have highest matrix score among all medium-risk wells
- Improving wire line and maintenance workshops  
Highlighted dormant risk of wells that are shut-in for long time and their integrity barrier elements have unknown conditions
- Application of scale management
- Issuing contracts to tackle challenges and benefit from innovative technologies



# Journey of Well Integrity Maturity

## Well Integrity Management System Verification and Continuity

- Well Integrity policy was revised and a new version was conducted
- Well Integrity categorization for water injectors
- Limit of allowable Hydrogen Sulfide level for online producing wells was set
- More gate valve milling and wellhead freezing jobs were conducted
- achieving zero overdue SSSV and X-tree tests for online wells





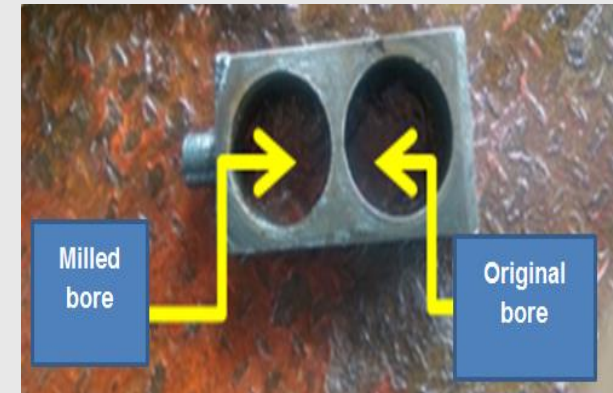
# Journey of Well Integrity Maturity

## Almost mature

WIMS is now normalized and level of awareness increased all over the organization.

Now the focus of the team will continue on;

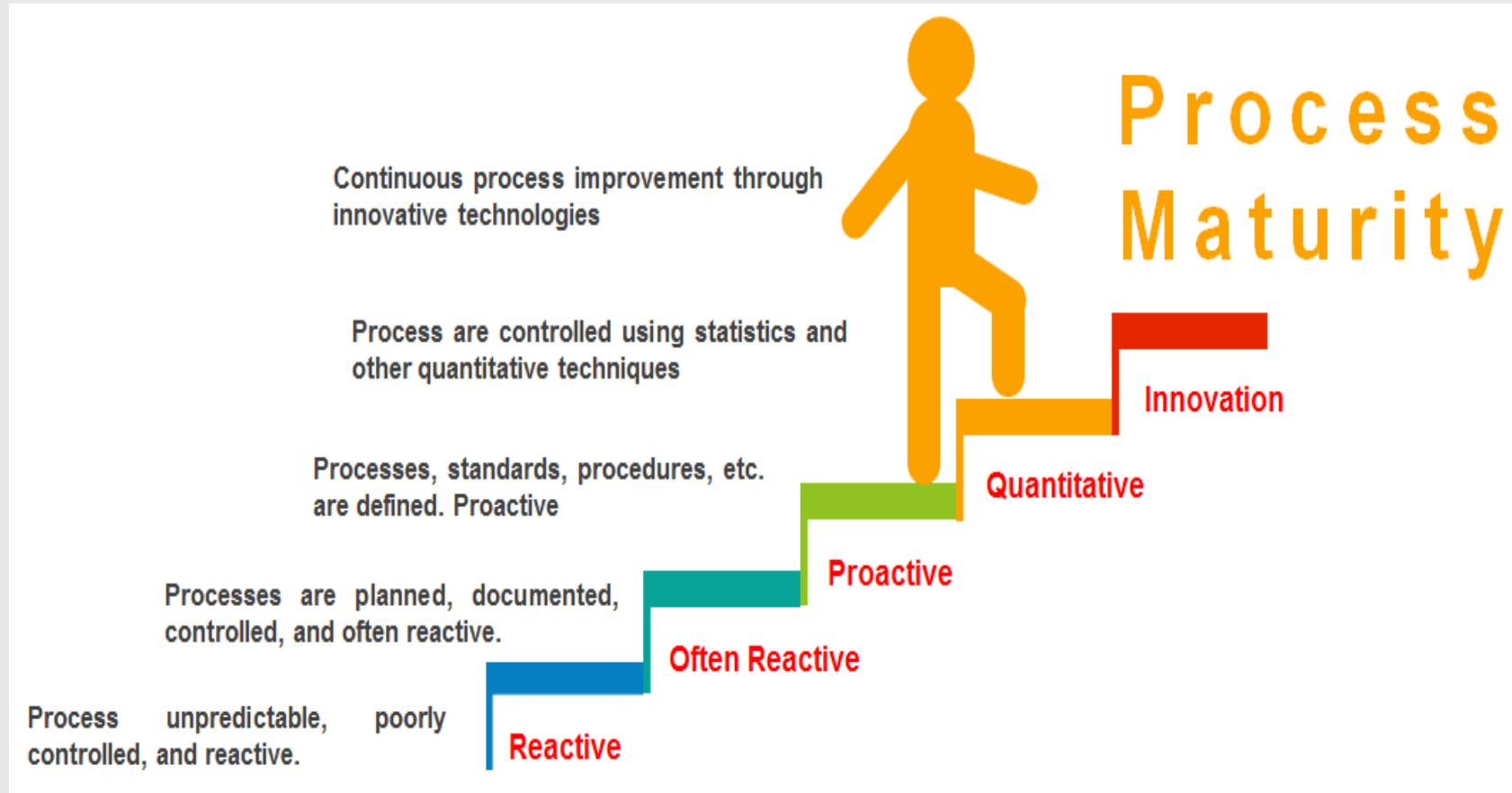
- Continue reduction of the High-risk wells
- Supervise safe breaking containment jobs
- Achieve zero overdue SSSV and X-tree PM.
- Issue and approve dispensations
- Confront dormant wells challenges





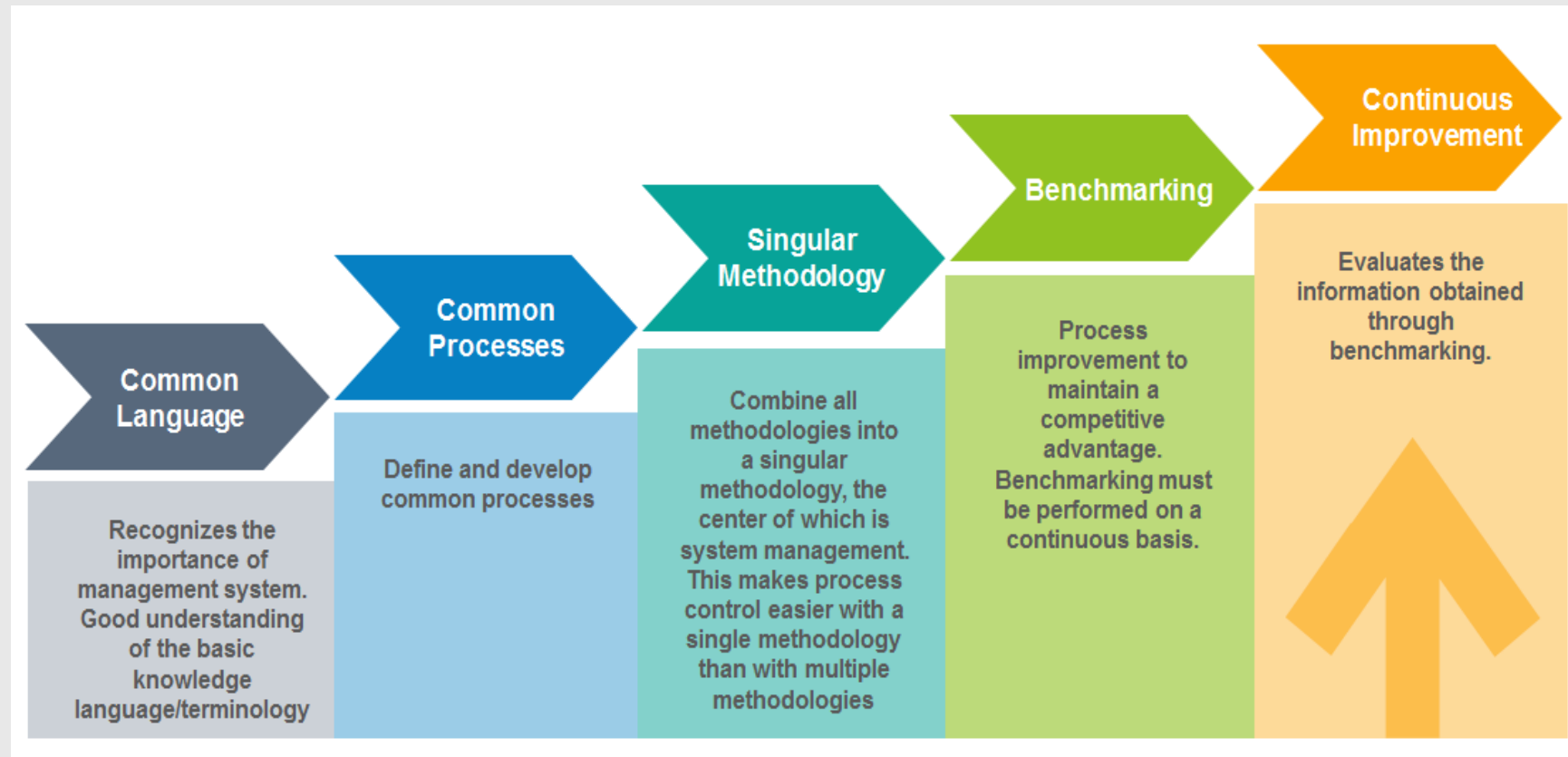
# Application of Maturity Models

Organizational project management maturity model (Opm3).



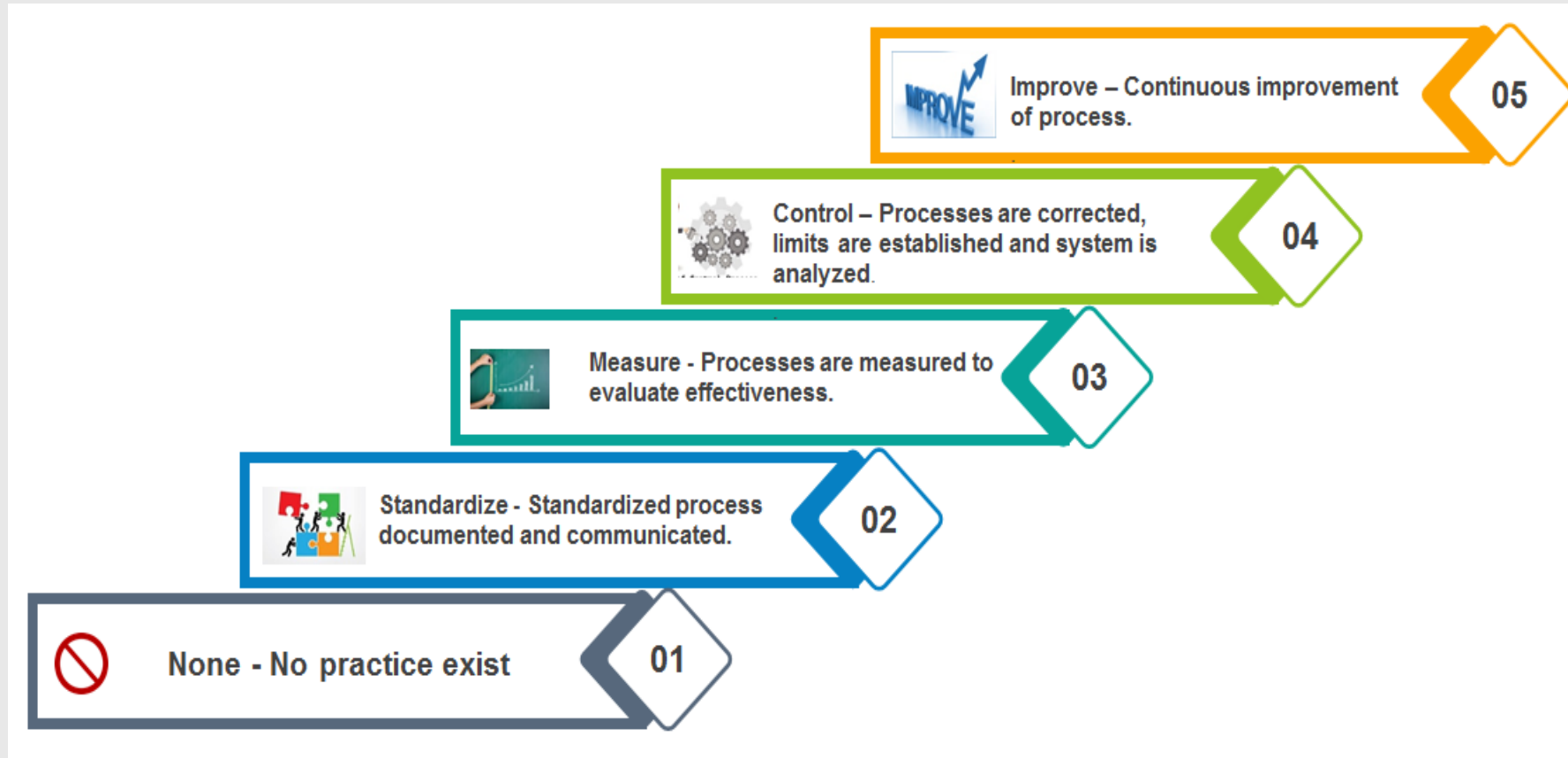
# Application of Maturity Models

## Capability Maturity Model Integration (CMMI).



# Application of Maturity Models

## Kerzner Project Management Maturity Model (K-PMMM).



# Conclusions and recommendations

- Well integrity is a key element for safety and operating integrity.
- Building new WI system for large brownfield facilities demands comprehensive resource management and optimization.
- Data and information management are critical components of managing a WI system.
- Increase in the maturity level of WI assists to operate the field at minimum level of risk and lower production deferral.
- K-PMMM showed the best description and level determination of maturity level with WIMS applied.
- It is highly recommended to implement maturity models by including all processes and subsystems in the WIMS.

# Acknowledgements

The authors would like to express appreciation for the support of the Gulf of Suez Petroleum Company (GUPCO) and permission to publish this work. The first author would like also to extended his appreciation for the faculty members in the department of petroleum engineering, Suez University, Egypt, for their continuous encouragement and support.

**Thanks for Your Attention**

**You are Welcome for Questions**