Innovarpel 2025

TECHNICAL DAYS

DIGITAL TRANSFORMATION
& INDUSTRIAL CYBERSECURITY
IN THE OIL&GAS INDUSTRY

arpel 60 YEARS

JUNE, 24 & 25
Rio de Janeiro, Brazil

Process Safety Management (PSM)

Can digitalization & AI help in decision making?

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COO – Grupo TEMA LITOCLEAN

TEMA LITOCLEAN GROUP

SEGURIDAD & MEDIO AMBIENTE tema

INVESTIGACIÓN & REMEDIACIÓN DE SUELOS litoclean

TRATAMIENTO & VALORIZACIÓN litosoil

CONSULTORÍA DE INGENIERÍA t-PRO

A real situation

4 HAZOP

Hazard and Operability Analysis

2 WHAT IF

What-If Risk Evaluation

2 HAZID

Hazard Identification

1 LOPA

Layer of Protection Analysis

1 QRA

Quantitative Risk Assessment

1 FERA

Fire, Explosion and Release Analysis

Innovarpel 2025

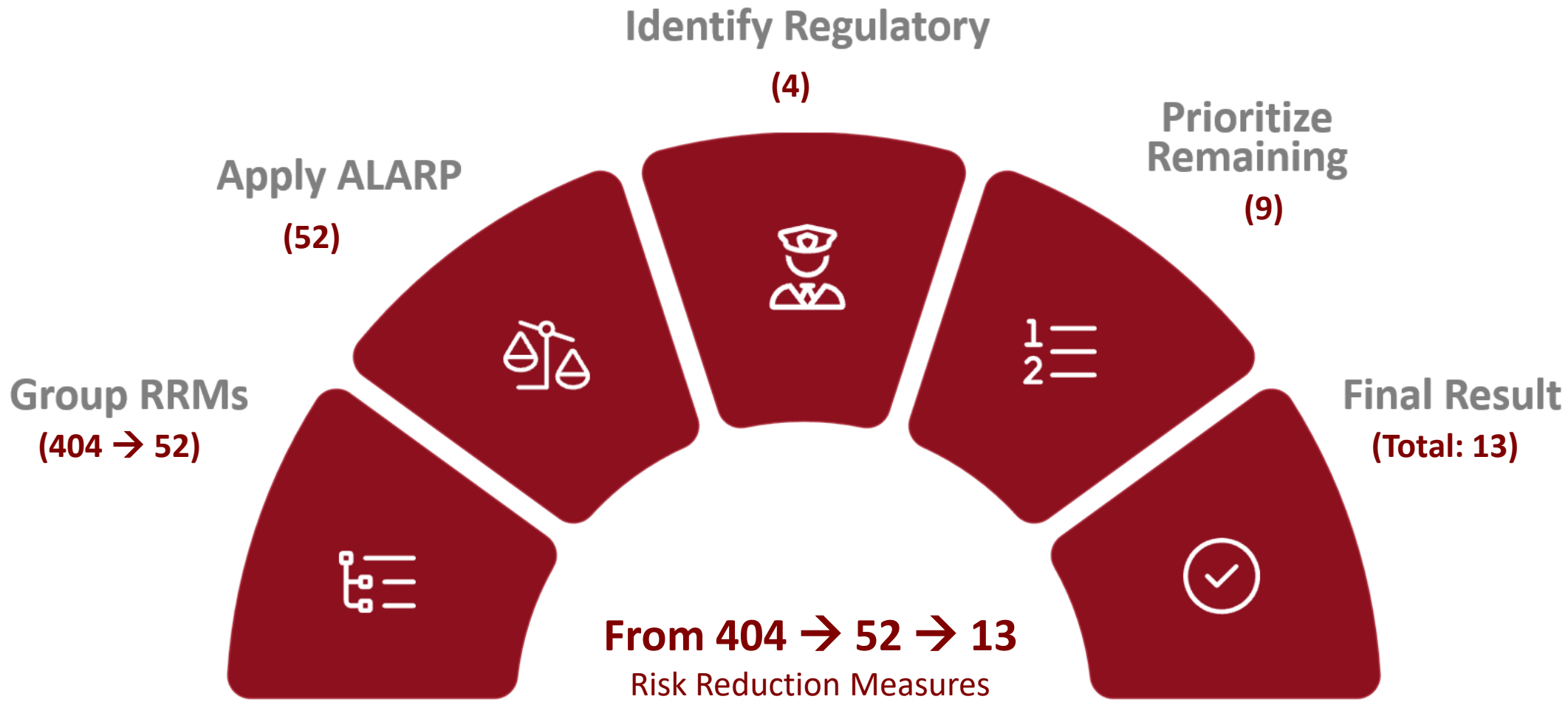
The studies resulted in a set of

404 RECOMMENDATIONS

(RISK REDUCTION MEASURES - RRM)

that must be managed

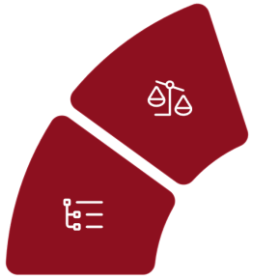
Let’s apply (our) Risk Management Cycle



Some insights of the process (Sorry! For later AI understanding)

Classification and Grouping of MRR:

- Scenario context
- Equipment involved
- Barrier type: preventive vs. mitigative
- Barrier category: administrative, technical, design, regulatory, etc.
- Led by Sr. & Jr. PSM engineers



ALARP (As Low As Reasonably Practical):

- Regulatory obligation
- Magnitude of Risk Reduction
- Repetition (cumulative risk)
- Implementation cost ($)
- Economic consequence cost ($)
- Cost-benefit ratio ($ avoided/$ invested)
- Practical feasibility

Consultants + Customer team involved along the process
TEAM Sessions for decision making
TIME consuming

Challenges in Process Safety Management

Optimize investments

Efficiently manage the Risk Management Cycle.

Maintain traceability

Digitalize the entire process with MS Power Platform.

Document decisions

Ensure all decisions are digitally recorded.

Support implementation

Digital tools aid in executing measures.

Ensure execution

Monitor and confirm completion of tasks.

Optimize this process

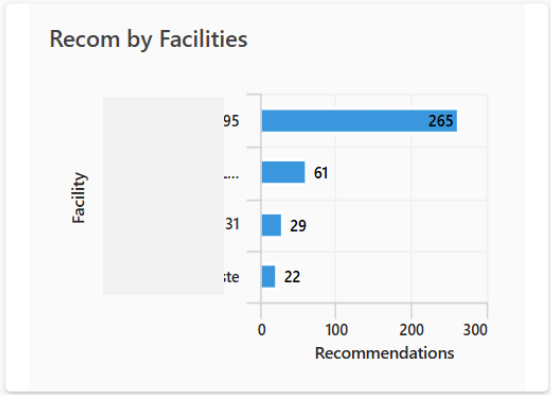
¿Generative AI for process accuracy & efficiency?

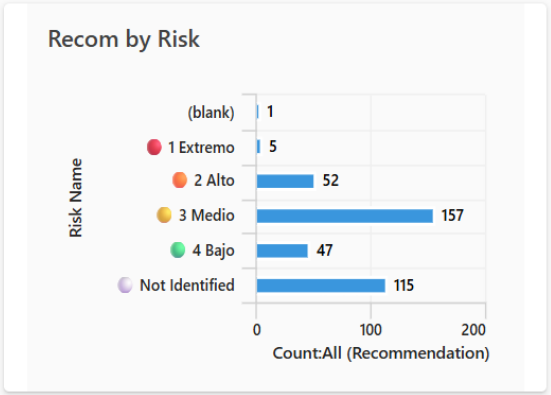
DIGITALIZATION

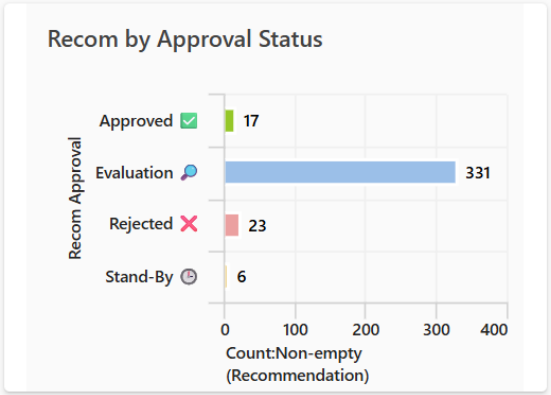
¿IA?

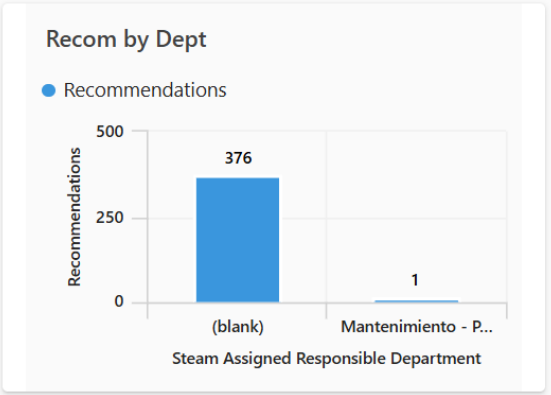
Digitalization

Company 1 | Clear All









View
331
Evaluation Recom View
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View
17
Approved Recom View
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View
6
Stand-By Recom View
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View
23
Rejected Recom View
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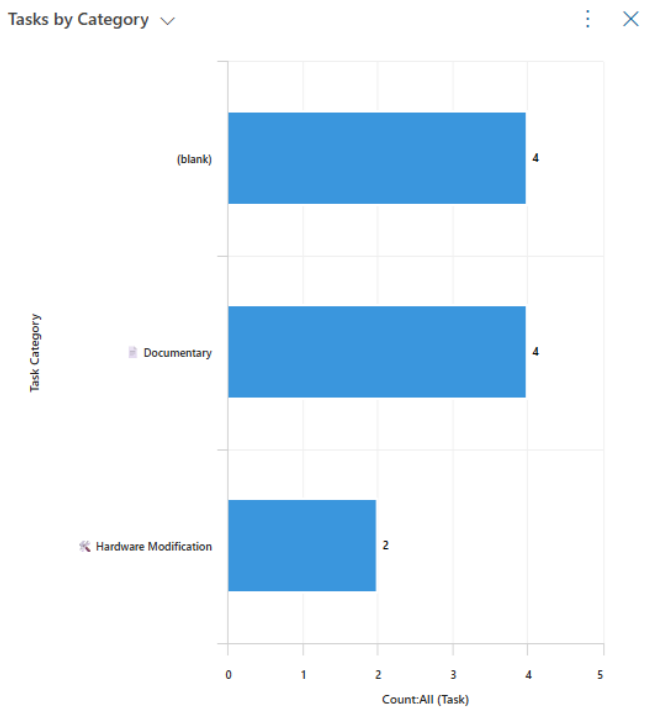
Digitalization

Main Tasks View*

Edit columns | Edit filters | Filter by keyword



Task	Title	Task Category	Risk (Recommendat...	Task Status	Timeliness
R.6 1058	TAREA DE PRUEBA	Documentary		Assigned	
R.24. 1059	Inducción en uso de App STEAM: Tarea de Prueba para rgara...	Documentary	2 Alto		
R.24. 1060	Inducción en uso de App STEAM: Tarea de Prueba para Iriver...	Hardware Modification	2 Alto	Rejected Doc...	Overdue
R.24. 1061	Inducción en uso de App STEAM: Tarea de Prueba para croja...		2 Alto	Assigned	Late
R.24. 1062	Inducción en uso de App STEAM: Tarea de Prueba para acarr...		2 Alto	Assigned	Overdue
R.34. 1063	Instalación de alarma de bajo flujo en FIT-2P940	Hardware Modification	2 Alto	Implemented	Late
R.48. 1064	prueba1		Not Identified		Late
R.24. 1065	ESTUDIO ADICIONAL - PRUEBA	Documentary	2 Alto	Implemented	
R.24. 1066	ESTUDIO ADICIONAL - PRUEBA	Documentary	2 Alto		
R.2. 1067	prueba labert		Not Identified		

Rows: 10

Boost productivity on collaborative environments (MS Power Platform), keeping track of all decisions.

Digitalization

R.24. 1061 - Saved
Task

ERS HAZOP CAMPO BRETAÑA LOTE 95 (PTP-OPE-OD-005)
Project

R.24.
Recommendation

General | Files | Log

Show form fill assist

General Information

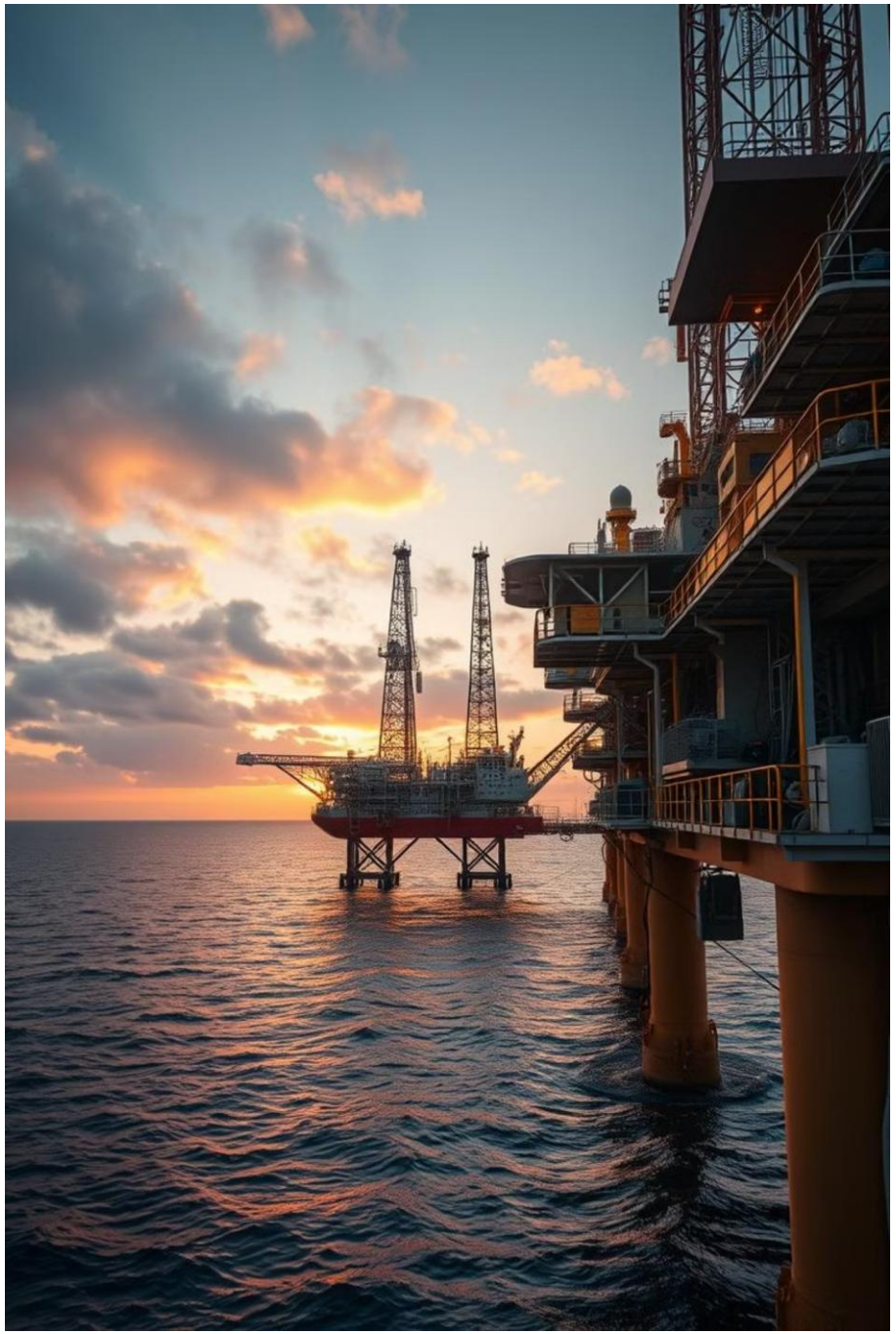
Title	Actualizar procedimientos operativos		
Start Date *	5/12/2025	Actual Implementation Date	5/30/2025
Responsible *	# Cesar Rojas (Offline)	Resposible Department	OPERACIONES - EHS.
Category	Documentary	Description	Actualizar los 4 procedimientos operativos del Tren de Inyección de Diluyente (Ver nodo)

Task Status Details

Status	Assigned	Expected Implementation Date	6/13/2025
Timeliness Status	Late		

Recommendation Information

Project *	ERS HAZOP CAMPO BRETAÑA LOTE 95 (PTP-OPE-OD-005)	Node *	. Tren Inyección De Diluyente Desde Tanques Diluyente (1-T-700A/2-...
Study Type	HAZOP	File Description	
Project Description	La Empresa PetroTal Perú SRL. (en adelante PetroTal), es una empresa liderada y operada por peruanos, que se dedica a la exploración, explotación y comercialización de hidrocarburos en el Perú, en mérito al contrato de licencia suscrito con el Estado Peruano a través de Perupetro S.A. por el Lote 95, ubicado en el distrito de Puinahua, provincia de Requena, región Loreto. En la instalación de CPF3, se realiza la recolección de la producción de los pozos a través de manifold, que posteriormente se dirigen hacia los separadores trifásicos y tratadores térmicos. Se realiza el tratamiento en los desaladores eléctricos, para luego enviarlo a los tanques de	Date	1/17/2023
		Created On	5/25/2025 8:59 PM
		Add Files	No



Digitalization

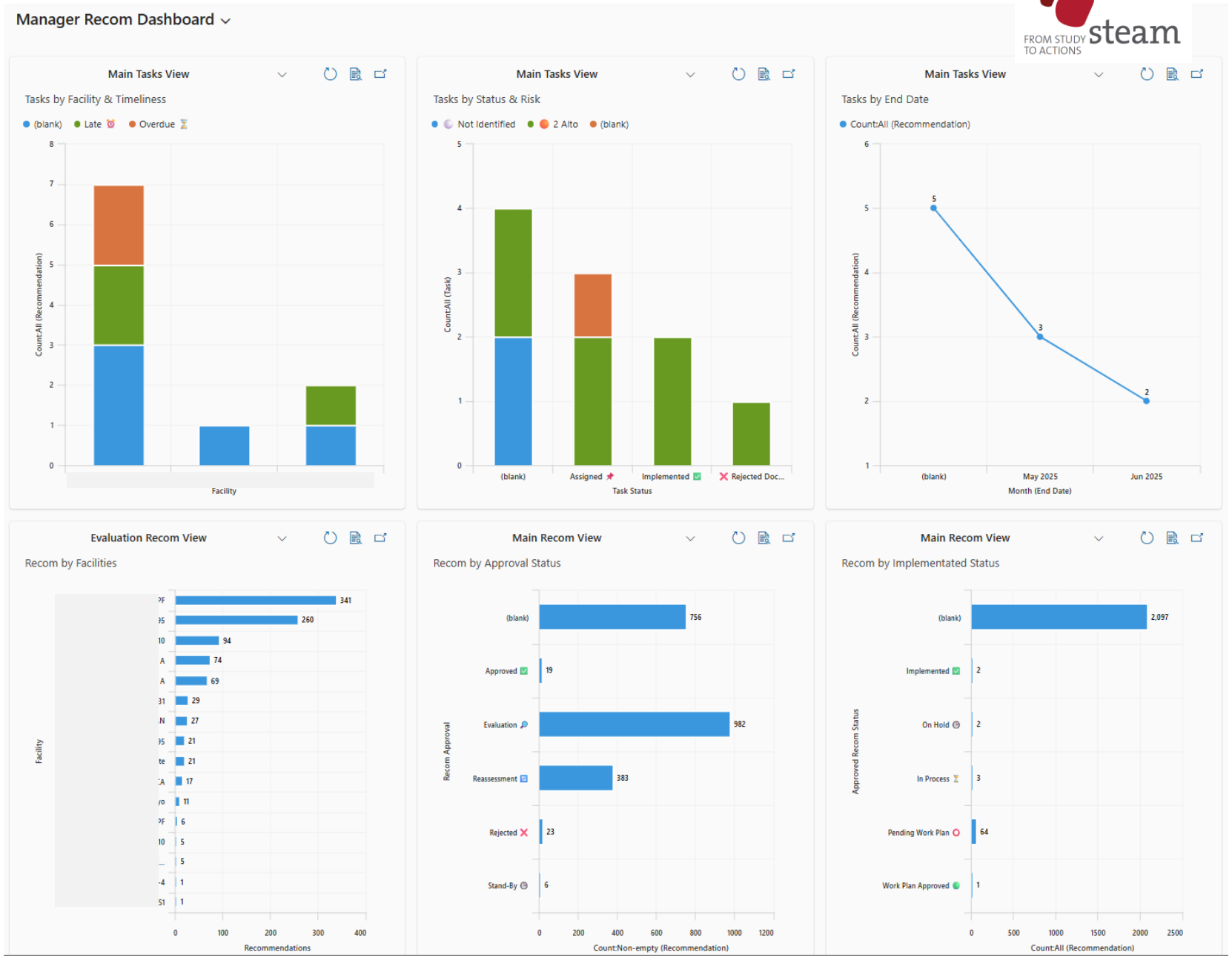
Management of actions portfolio +

Eco & Risk based approach +

Decision making

Distribución de escenarios según el riesgo

	1	2	3	4
A	33	8	5	2
B	102	25	3	2
C	46	74	50	11
D	17	85	139	21
E	2	7	15	1



Can AI help on the process of taking decisions?
Proof of Concept Objectives:

Optimize Resources
Improve classification and grouping of RRMs.

Enhance Data Quality
Improve data for ALARP reasoning.

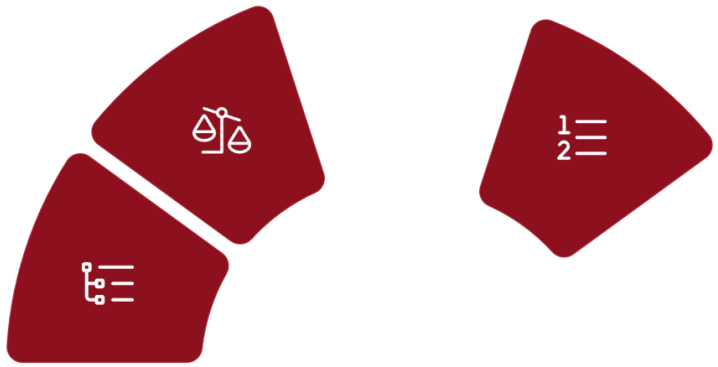
Generate Prioritization
Create primary RRM prioritization for decisions.

Standardize Process
Ensure consistency across all PSM activities.

Two approaches:

3 DIFFERENT TASKS:

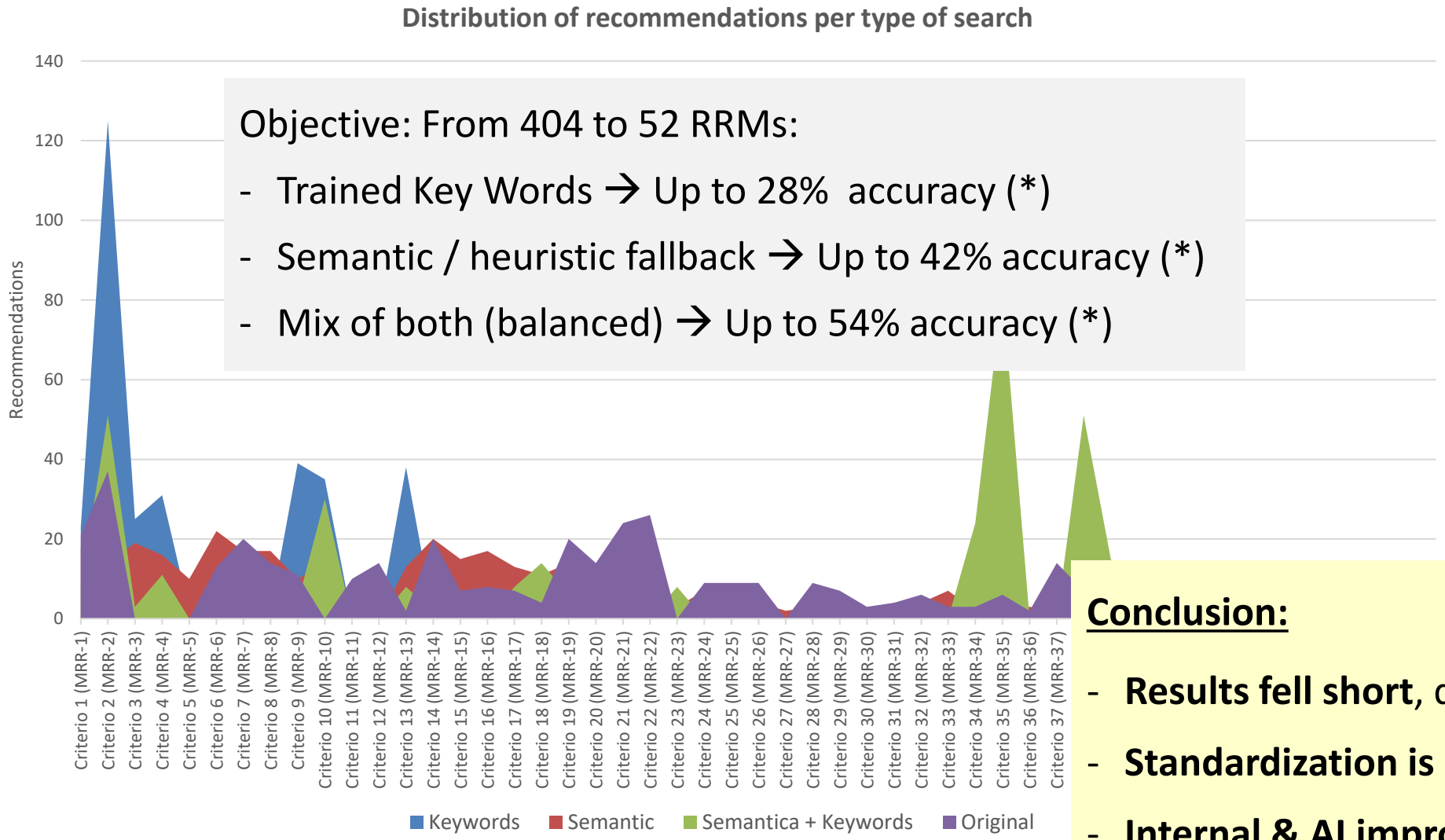
- Classification and Grouping of RRM
- ALARP (As Low As Reasonably Practical)
- Define priorities



SUPER PROMPT:

- We asked the Generative AI to make the whole process for us. From 404 recommendations to a list of 15 Risk Reduction Measures (RRM).

STEP 1. Classification and grouping of MRR



Objective: From 404 to 52 RRMs:

- Trained Key Words → Up to 28% accuracy (*)
- Semantic / heuristic fallback → Up to 42% accuracy (*)
- Mix of both (balanced) → Up to 54% accuracy (*)

Conclusion:

- **Results fell short**, despite solid effort.
- **Standardization is key** before using AI.
- **Internal & AI improvements** are needed.

(*) Accuracy is determined by comparison to the human process

STEP 2 & 3. ALARP Criteria + Prioritization

Criterion	AI Performance	Comment
✅ Risk Reduction	✓ Adequate	Correctly interpreted risk levels
🔁 Repetition (Cumulative Risk)	✓ Adequate	Detected recurrence across scenarios
💰 Cost of Implementation	✓ Accurate (Class 5)	Works well with clear, prompted inputs
📉 Economic Impact	⚠️ Inconsistent	Improves with detailed input, still less precise
📊 Final Prioritization	✓ Acceptable	Integrates variables logically
📈 Overall Match	65–70% vs. expert results	Good first-trial outcome

Conclusion:

- **Speeds up the process** significantly.
- **Accuracy is sufficient** for early-stage evaluation.
- **Requires full senior oversight** for final decisions.

ALTERNATIVE – Super prompt approach

Objective:

- Reduce 404 initial recommendations directly to 15 high-impact RRMs

Results:

- Accuracy: 55 – 65 % alignment with human process
- Performance: better than expected

Key Insights:

- High potential: exceeded initial goals
- Requires tuning: further model training & prompt refinement
- Custom fit: prompt must be adapted per client/project

Conclusions:

- Not production-ready: Accuracy needs improvement
- Scalability gaps: Further optimization required.
- Promising path: Worth continued development.

Conclusions

- **From Risk Studies to Actions** requires a structured, repeatable **process.**

- **Digitalization improves – it is a must!**
  - Traceability / Collaboration / Decision-making

- **Generative AI – keep working, is the future!**
  - Weak at classifying/grouping RRMs – can't yet replicate Sr. PSM judgment.
  - Helpful for ALARP data gathering but needs full human supervision and adjustment.
  - Supports prioritization if prior steps are well-defined.
  - Can speed up Jr. engineer tasks but still needs Sr. oversight → no net time gain, yet.
  - Further training and customization required to increase reliability.

Three final questions

Conclusions & Next Steps

Future Use

Approved for future use

(internally)

Hybrid Approach

Step-by-step + super prompt

Integration in Platform

Under evaluation, needs consistency

Thank You!

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