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Menara Felda, Platinum Park KLCC

Driving Innovation: Technological Advancement in Civil & Structural Asset Integrity at PETRONAS



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PETRONAS

An Overview

Petroleum Nasional Berhad (PETRONAS) established in **1974** as Malaysia's national oil and gas company.

Today its operation is worldwide with presence over 100 countries.



Presence in
over **100**
countries



Ranked 1st
Most Valuable
ASEAN Brand*



Over **50,000**
employees
globally



Top 10
Most Valuable Oil
and Gas Brand*



Ranked 139th
on Fortune Global 500



PETRONAS



1974

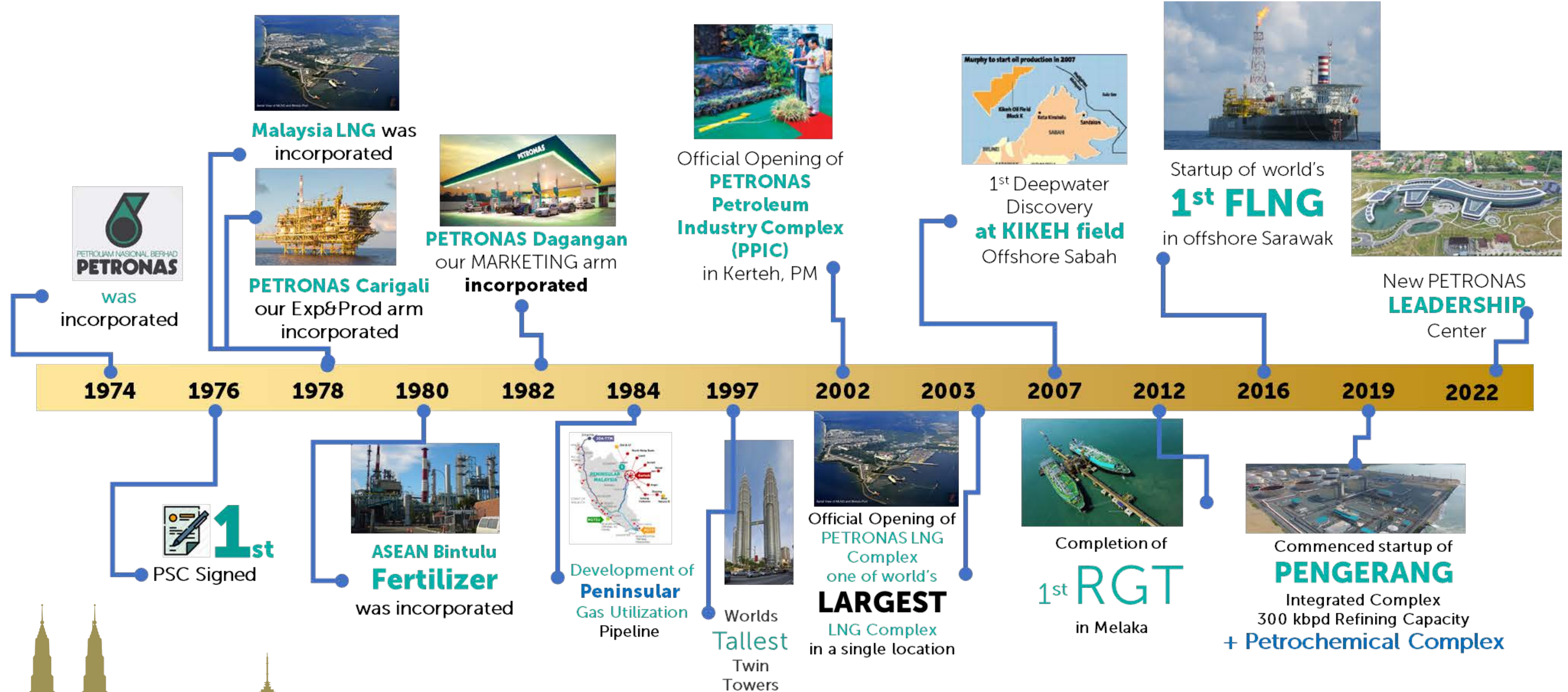
Our first office with only 15 personnel at the Prime Minister's Department at Jalan Dato' Onn, Kuala Lumpur





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Malaysia has come a long way since the inception of **PETRONAS** in 1974, from a producer of crude & petroleum products to a world-class hub for petroleum, petrochemical, and LNG industries it is today





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PETRONAS MAJOR STRUCTURES

Background

To date, the quantum of major structures have grown and expanded, consisting of the following.



ONSHORE
77 PLANTS



OFFSHORE
>220 PLATFORMS



FLOATER
34 FPSO



GEOTECH
3000 KM PIPELINE

These assets have been **built and acquired**, and as a **responsible operator**, we maintain them **to ensure the safety and reliability of all operations**. Therefore, significant emphasis is placed on **asset integrity**. Consequently, a proactive structural integrity management system has been **developed and is being implemented**.



CURRENT CHALLENGES

Despite having an integrity management system in place, the following challenges persist.

Growing Aging Assets

Time Consuming Manual Inspection

Resource Optimization

Backlog of Inspection & Repair

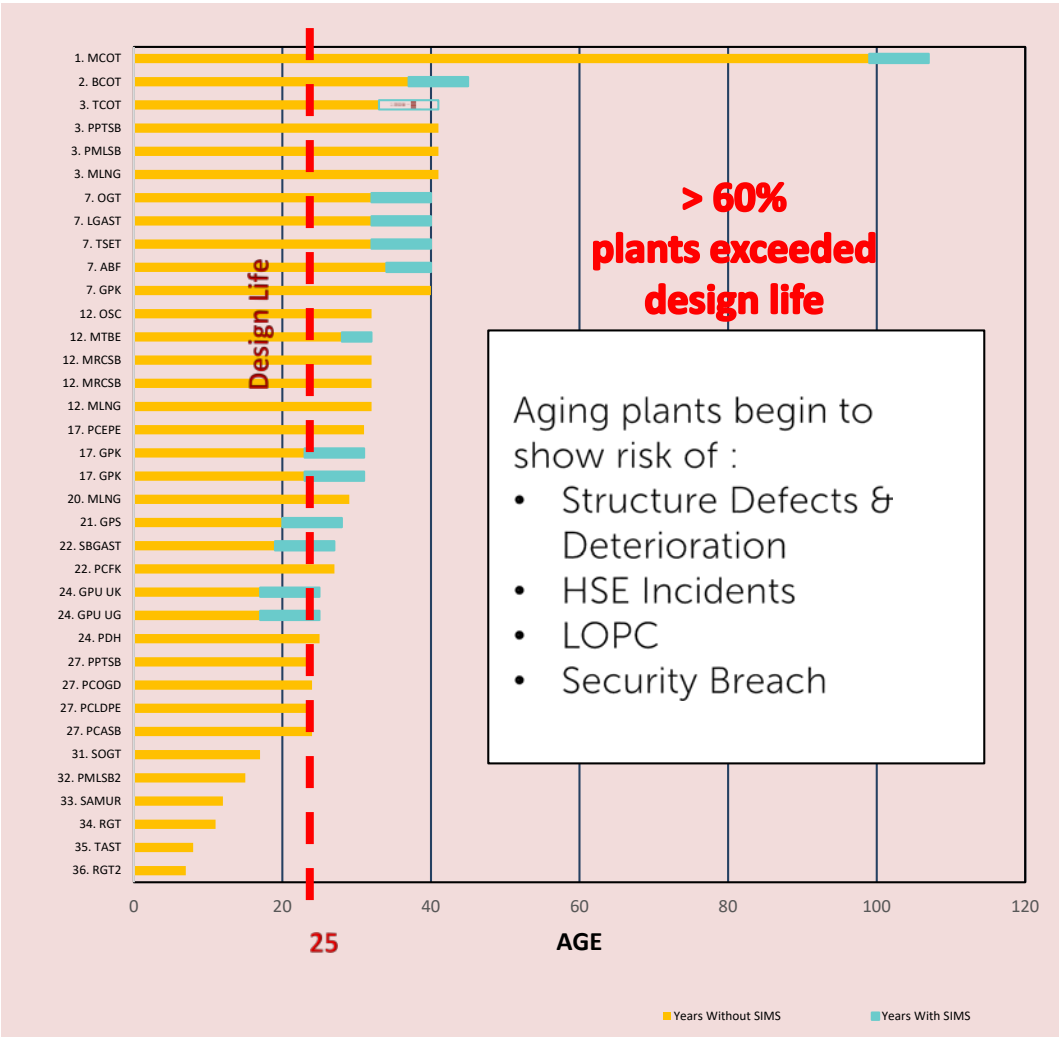
Severely Corroded Structure Supporting Flare Line



C1 Tank Foundation damage due to degrading asphalt



Failing Fireproofing (SCE Element)



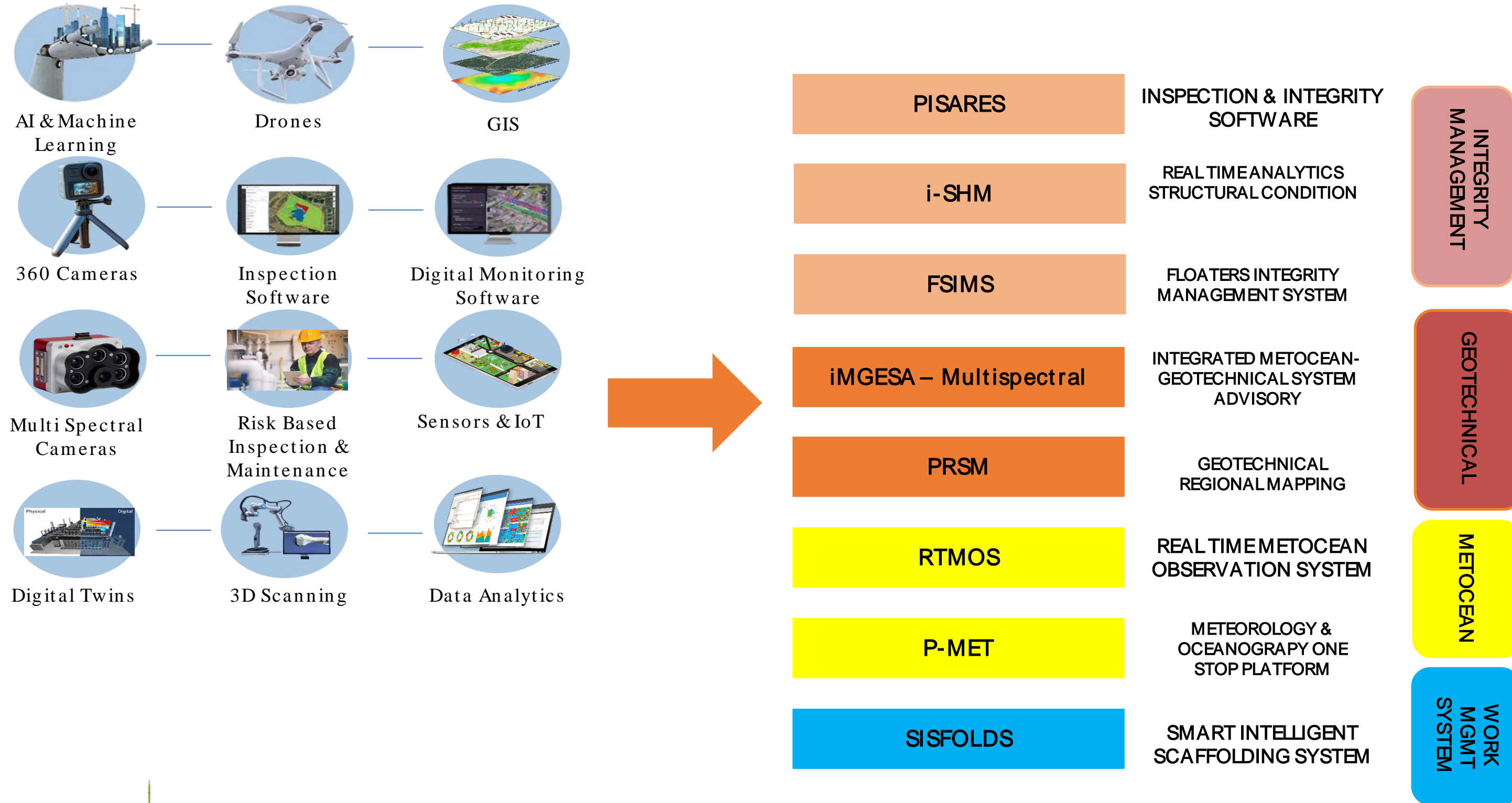
SSGP (partially abandoned in 2023)



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TECHNOLOGIES

To address these challenges, we are actively pursuing **new technologies** and have initiated various **in-house C&S solutions**.



PISARES – AI Defect Detection & Classification

PISARES

- ❑ **PISARES** provides line of sight to business on overall Health Check for C&S asset through delivery of cost effective, predictive and fit for purpose solutions.
- ❑ Utilizing affordable and **COMMON TOOLS** for plant general visual inspection.



- **AUTOMATED INSPECTION OUTPUT** Annotated photos and tabulated results for next stage of assessment.

Figure 10 is an aerial view of a gas pipeline system. It shows a large main pipeline and several smaller branch pipes. Annotations include:

- Model:**
 - Model: Corr (for a section of the main pipe)
 - Model: Corr (for a section of a branch pipe)
 - Model: Corr (for a section of another branch pipe)
- Defect Type:**
 - minor (for three different locations)
- GPS Info:** Indicated by a yellow arrow pointing to a specific location on the main pipe.

Below the image is a table with 15 rows of data, representing a list of defects. The columns are: ID, SN, GE, GPS, DEFECT DATE, DEFECT TYPE, DEFECT ASSET, and DEFECT ID.

ID	SN	GE	GPS	DEFECT DATE	DEFECT TYPE	DEFECT ASSET	DEFECT ID
10	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
11	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
12	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
13	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
14	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
15	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
16	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
17	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
18	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
19	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
20	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
21	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
22	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
23	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
24	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00
25	10.0000	1.0000	100.00.00	2010-01-01	minor	10	10.00.00.00





iMGESA – Integrated Metocean-Geotechnical System Advisory

iMGESA - Multispectral

1. Drone equipped with **MULTISPECTRAL SENSORS** can rapidly capture high-resolution imagery of extensive areas, providing a comprehensive overview of terrain conditions. This efficiency **REDUCES TIME AND RESOURCES** required for data collection.



Why **MULTISPECTRAL SENSORS**?

1. Enhance productivity of **GEOHAZARDS DETECTION**
2. **MANHOURS OPTIMISATION** of field work activities.
3. Able to generate indices maps of geohazard detection within **SHORT PERIOD OF TIME**.
4. Able to **AUTOMATE THE PROCESS** and provides **EFFICIENCY** and **PRECISION**.
5. Effective **INSPECTION AND MONITORING**.



Detection rate of
Sign of Distresses
is 93%





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i-SHM – Intelligent Structural Health Monitoring

SHM

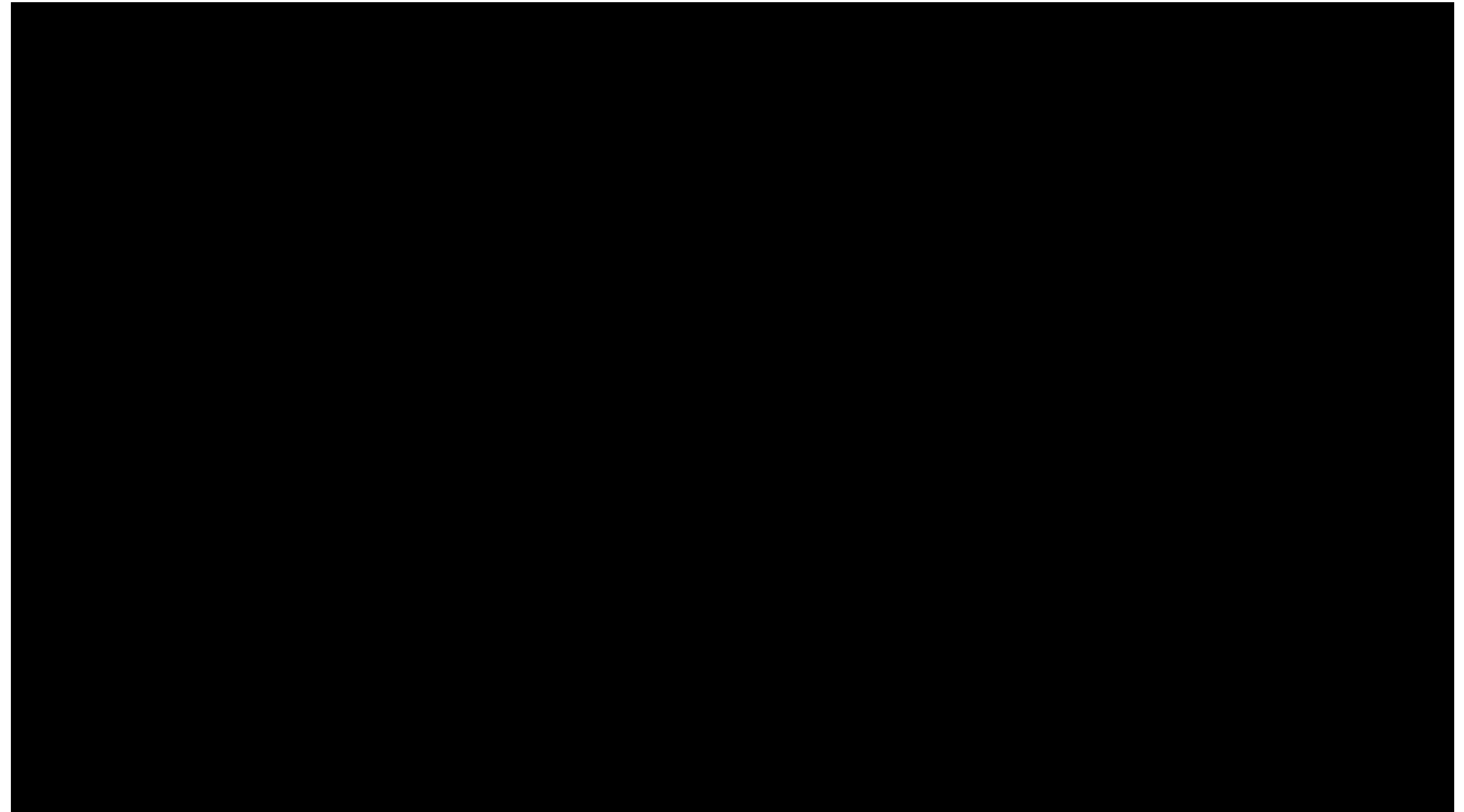
1. Using hardware that utilize the **ENTERPRISE-GRADE STRUCTURAL SENSORS** to monitor real-time conditions.



2. Physics Engine & Cloud Dashboard that **DELIVER REAL-TIME ANALYTICS OF STRUCTURAL CONDITION** through web-based digital twin of asset.

OUTCOME

1. Real time and automated update of our assets essential data e.g., weight, stiffness, natural period, fatigue sensitive joints etc.
2. To **CAPTURE THE DEGRADATION OF AGEING ASSETS** through **DIGITAL TWIN** utilizing **physics engine** and **real time in site assessment** which will optimize the required inspection & maintenance work.





SISFOLDS – Smart Intelligent Scaffolding System

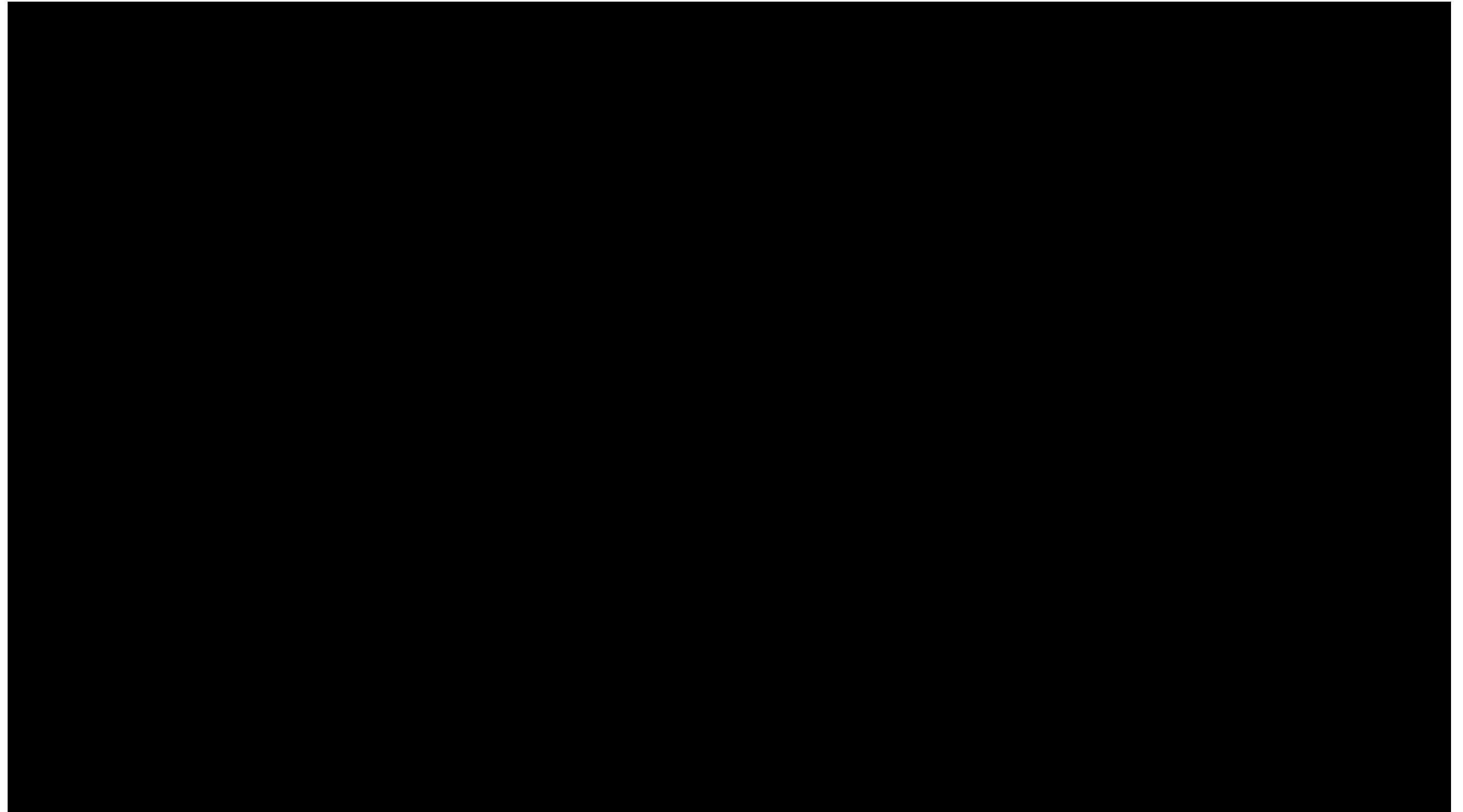
SISFOLDS

1. What is **SISFOLDS**?

SISFOLDS is a techno-digital scaffolding management that produce real time monitoring dashboard at Enterprise level.

2. Why we need **SISFOLDS**?

- Managing **HUGE** volume of scaffold request.
- Improve scaffold **SAFETY** on green tag validity, material PPS, competent scaffolders tracking, design etc.
- Enhance **WORK EFFICIENCY** through **REAL-TIME** system & tracking incl. notification/reminder.
- Digital **BIG DATA** management and record.
- Address **LATE** dismantlement issues.
- Minimise **value leakage**.



CONCLUSION

- **PETRONAS** has empowered its engineers to develop solutions that significantly enhance time management, optimize resource allocation, and ensure continuous asset management, leading to increased operational efficiency.
- The solutions are versatile and suitable for a range of major industries, **requiring only minor modifications** for tailored applications.
- **PETRONAS** is committed to advancement and technology and open to collaborations with any industry.

Visit us at **PETRONAS** booth for further
information of solutions.