

REMOTE DRILLING & COMPLETION



Remote Drilling & Completion transpires as the solution towards effective manning strategy to improve well cost and safety to personnel.

Four main enablers:

- Contract Strategy** Strategy to combine multiple scope or integrated model
- Remote Monitoring** Monitoring from town i.e. DD/MWD, liner hanger
- Operational Optimization** Multi skilling, cross-function, minimize intervention
- Automation** Technology driven to automate certain function i.e. TRS

Technology-Driven

- Remote Operation
- Automation

Strategy-Driven

- Contract Strategy
- Operational optimization

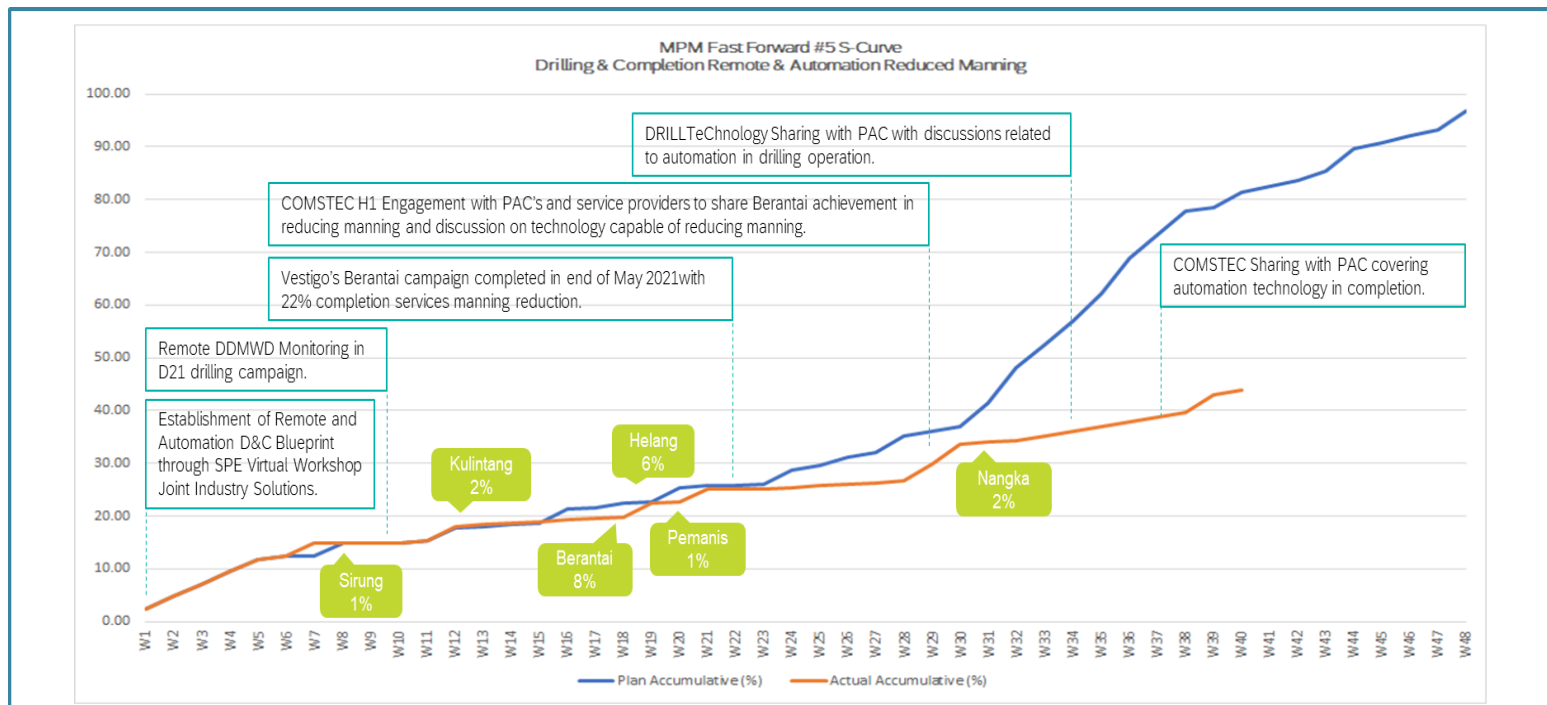
Category Definition

- Category 1 for most feasible applications.
- Category 4 for the least feasible applications.

Activity	Strategy/Technology	CAT	Code	Description	CAT. 1	CAT. 2	CAT. 3	CAT. 4
DDMWD	Strategy driven	CAT 1	D1.2	DDMWD Personnel up-skilling / cross-function training	■			
Filtration	Strategy driven	CAT 1	C1.1	Filtration integration with fluids	■			
Liner Hanger	Strategy driven	CAT 1	C10.1	Liner personnel optimization	■			
TCP	Strategy driven	CAT 1	C9.1	TCP personnel optimization	■			
Completion	Strategy driven	CAT 2	D2.2	Integrated Upper & Lower Completion		■		
Mud Logging	Strategy driven	CAT 2	C3.3	Mud logging upskilling/cross function training		■		
Solid Control	Strategy driven	CAT 2	D4.1	Solid Control integrate with fluid		■		
Wellbore Cleanup	Strategy driven	CAT 2	O5.1	WBCU Combine scope with completion/liner		■		
Cementing	Strategy driven	CAT 3	D6.1	Remote cementing consultancy / support			■	
Drilling Fluid	Strategy driven	CAT 3	D3.2	Maintaining fluid solid control and rheology equipment			■	
Well Test	Strategy driven	CAT 4	C7.1	Well test personnel optimization				■
GP Pumping	Strategy driven	CAT 4	C4.1	Remote pumping rig up monitoring				■
DDMWD	Technology driven	CAT 1	D1.1	Remote drilling and MWD monitoring	■			
E-line	Technology driven	CAT 2	C8.1	Remote wireline monitoring - C		■		
E-line	Technology driven	CAT 2	D5.1	Remote wireline monitoring - D		■		
Mud Logging	Technology driven	CAT 2	D2.1	Remote mud logging monitoring		■		
Slickline	Technology driven	CAT 2	C6.1	Interventionless completion equipment		■		
TRS	Technology driven	CAT 2	C2.1	Automated make up system (e.g. Vero) - C		■		

HOW TO GET THERE?

Journey Towards The Goal : 2021 Progress and Achievement



- Achieved total of 8.5% manning reduction for drilling and completion operations in 2021.
- Estimated about RM 3 million of cost saving gained from the manning reduction.
- MPM Wells Management have established an enhanced Remote D&C roadmap with Key Enablers to gain more traction in replicating the most feasible strategies. Continuous effort in conducting DRILLTeC and COMSTEC sharing sessions to influence PAC's in full implementation of the enablers.

Four Main Enablers for Remote and Automation

Four main enablers:

Contract Strategy

Strategy to combine multiple scope or integrated model

Remote Monitoring

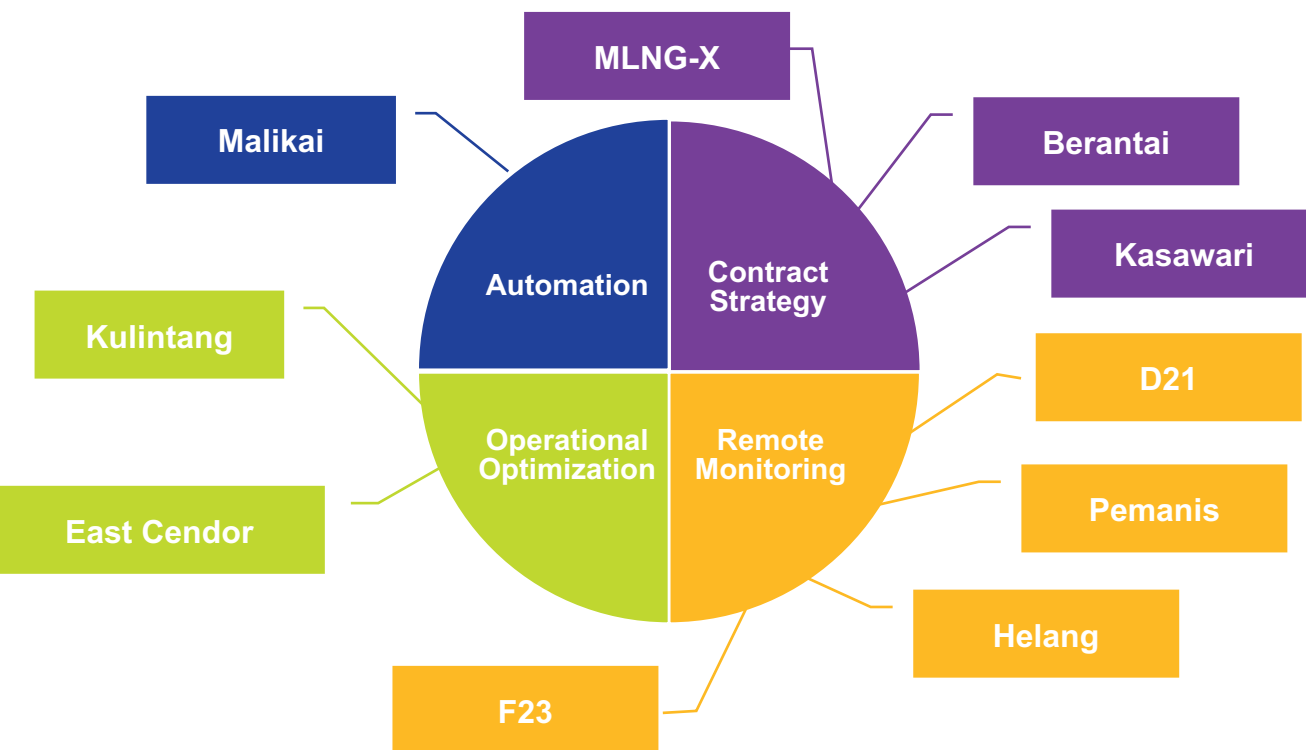
Monitoring from town i.e. DD/MWD, liner hanger

Operational Optimization

Multi skilling, cross-function, minimize intervention

Automation

Technology driven to automate certain function i.e. TRS



Remote and Automation D&C Roadmap

Description	Base	2022	2023	2024
Remote cementing consultancy / support	3	2	2	1
Integrated Upper & Lower Completion	4	3	3	3
Single trip (e.g. TR1P)	4	3	3	2
Two-way telemetry completion system	4	3	3	2
DDMWD Personnel up-skilling / cross-function training	6	4	3	3
Remote drilling and MWD monitoring	6	4	4	3
Maintaining fluid solid control and rheology equipment	2	2	1	1
Real time fluid monitoring	2	2	1	1
Remote wireline monitoring - C	8	6	6	5
Remote wireline monitoring - D	8	6	6	5
Filtration integration with fluids	4	3	2	2
Remote pumping rig up monitoring	14	13	13	12
Liner personnel optimization	2	1	1	1
Mud logging upskilling/cross function training	6	4	4	3
Remote mud logging monitoring	6	4	4	3
Interventionless completion equipment	4	3	3	2
Solid Control integrate with fluid	4	3	2	2
TCP personnel optimization	4	3	2	2
Automated make up system (e.g. Vero) - C	6	4	4	3
Automated make up system (e.g. Vero) - D	6	4	4	3
Well test personnel optimization	16	15	14	14
WBCU Combine scope with completion/liner	2	1	1	1

**Base personnel quantity based on SPE Blueprint for Remote Operation and Automation, 2020*