Challenge
Reduce skin and improve the productivity index (PI) in new wells to increase overall field productivity for Petronas Carigali Sendirian Berhad (PCSB).

Solution
Use the PURE* clean perforations system to achieve greater productivity than is possible with conventional static underbalance perforating.

Results
Compared with other wells in the region that had been perforated conventionally, the well perforated using the PURE system enabled additional production and significantly reduced the production payback period.

PCSB wanted to improve the PI in new offshore wells to increase field productivity
A field in the PMO region was put into commercial operation with initial total production rates of 15,000 bbl/d oil and 60 MMcf/d gas.

Because the field is one of the biggest oil producers in Malaysia—contributing one-sixth of the total national oil production—its development is considered essential to meeting the nation’s rapidly increasing need for hydrocarbons.

Previously, all the region’s wells had been perforated using conventional static underbalance to clean damage and debris from the perforations. The results had been high skin values and, therefore, lower-than-desired PIs.

PCSB sought to maximize field recovery and meet production forecasts by improving the deliverability of new expansion wells.

Schlumberger proposed PURE system to maximize productivity
For the second expansion phase in the field, Schlumberger proposed using the PURE system. Unlike conventional perforating, which relies on a large static pressure differential between the wellbore and the formation to remove perforation debris and crushed-zone damage, the PURE system fully exploits the transient underbalance that occurs immediately after perforating. It creates a large dynamic underbalance, then absorbs perforation debris into the gun chambers, minimizing skin and leaving an obstruction-free path for flow from the reservoir to the wellbore.

The PURE system planner software was used to specify the unique perforating system based on full consideration of the completions geometry, reservoir fluids, and formation characteristics. SPAN* Schlumberger perforating analysis was used to select the most suitable gun configuration, shot density, and charges and to simulate operation performance. A tubing-conveyed perforating system was used to perforate the well, allowing perforating and testing in a single trip.
**CASE STUDY:** PURE system dynamic underbalance enables higher PIs and production, Malaysia

**PCSB was able to be certain its expansion wells would have higher PIs than previous wells in the region**

A pressure buildup survey was conducted shortly after Well A was put into production. The calculated skin of 0.3 was significantly lower than skins measured in earlier field wells perforated using conventional techniques. No acid treatments or perforation washes were required.

Production from the layer perforated with the PURE system was significantly higher than production from neighboring wells. No water was produced for almost two years after startup.

The production payback period was only three days, and the total incremental value was determined to be USD 2.5 MM/month. This economic impact convinced PCSB to use the PURE system dynamic underbalance perforating in other fields it operates.

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**Fast gauge measurement showing the large dynamic underbalance created by the PURE system.**

**Optimized production history for Well A.**