

## OIL and GAS INDUSTRY

### Objective

- To get the prediction accuracy of a high gas producing wells by Auto-AI and SXI and compare.
- Precision AI<sup>2</sup> using Target SXI based Random Forest trees. Target increase in High gas production well is **20%** up from current levels.

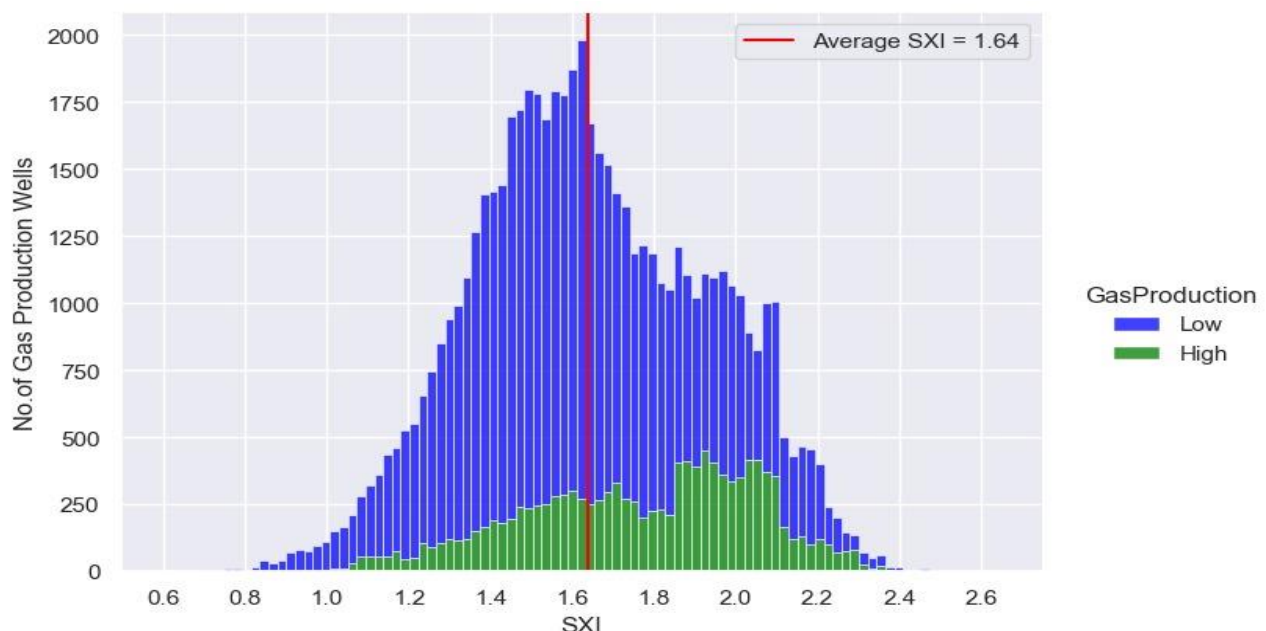
### SXI Hypothesis

- SXI is a proxy/surrogate for all features responsible for ensuring high or low gas production rate in the well. The higher the SXI, the better is the gas production efficiency and hence increasing SXI score should lead to higher gas producing well.

### SXI Definition

- **Sriya Expert Index (SXI)**: Dynamic score/index obtained from a proprietary formula consisting of weights from 10 ML algorithms. SXI is a super feature and is a true weighted representative of all important features. Converts a multi-dimensional hard to solve problem into a simpler 2-dimensional solution (problem solved).
- **SCORE + CORRELATE = IMPROVE**

## Discussion & Results



### 1. Exploratory Data Analysis

**60,000** wells were distributed to **12,368** good and **47632** bad. Good are high gas producing wells and Bad are low gas producing wells. So, **20.61%** is the current high gas production wells and **79.39%** is low gas production wells.

## 2. SXI - Exploratory Data Analysis

Current Average SXI is **1.64**. No. of total gas production wells above 1.64 is **28122** and of these **8146** are high gas production wells and **19976** are low gas production wells. So High gas production wells (%) are **28.9%** and low gas production wells are **71.1%**.

Correspondingly No. of total gas production wells below 1.64 is **31878** and of these **4222** are high and **27656** are low. So High gas production wells (%) are **13.24%** and low is **86.76%**.

So SXI is a perfect proxy/surrogate for High Gas Production wells and above average SXI ratio of good outcome is **1.4x** of the overall average and below average SXI ratio of good outcome is **0.64** overall average. So, the increase in SXI leads to an increase in high gas production wells.

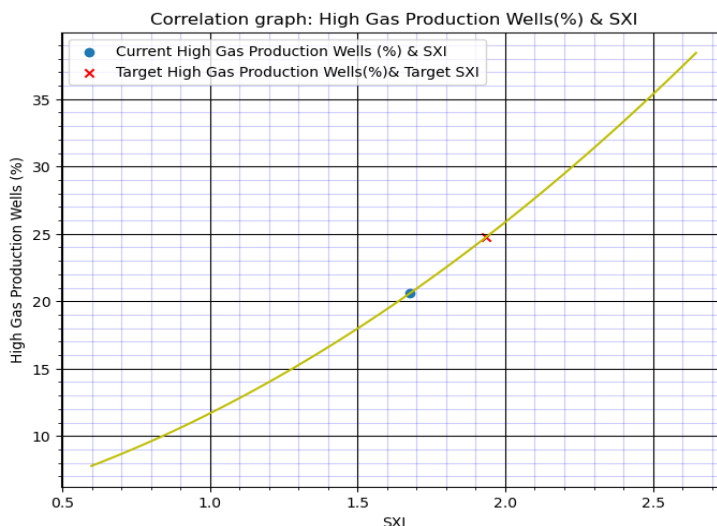
## 3. Predictive AI

- Auto-AI Prediction accuracy is **87.5%** and the best performing algorithm is **Random Forest**.
- SXI Prediction accuracy of high gas production well is **100%**.
- Ratio of SXI/Auto-AI prediction accuracy is **1.14**.

## 4. Precision AI

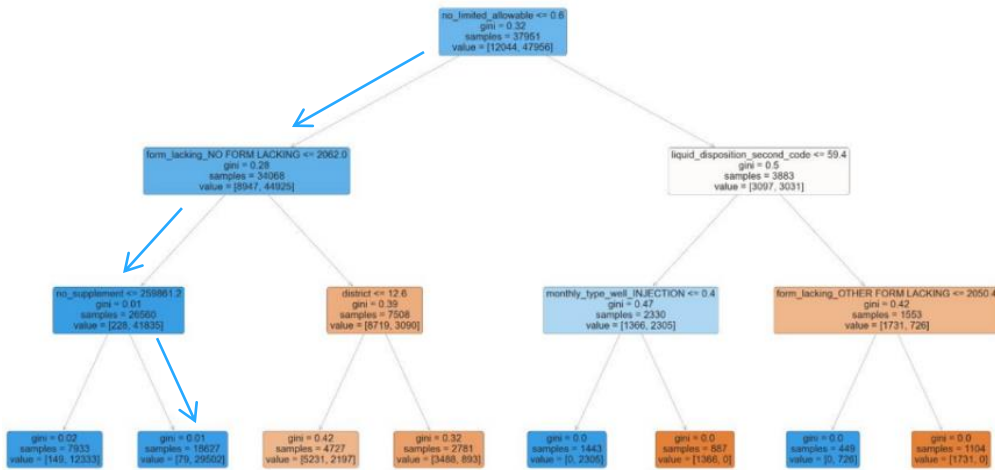
The desired increase in target variable which is high gas production well rate is 20%. The original high gas production rate is **20.61%** so a **20%** increase should lead to a **24.73%** overall high gas producing wells (**20.61\*1.2**). Which means **14,842** of the wells from 60,000 would become high gas producing wells rather than current **12,368**.

The correlation between SXI and High Gas Production Rate is **0.99**. This implies that SXI and High Gas Production rate are highly positively correlated to each other. Hence, an increase in SXI will result in increase in High Gas Production rate.



**Current SXI and Target SXI Decision Trees**

**a. Current SXI Decision Tree**



**Interpretation: -**

**Node 1:** No\_limited allowable <= 0.6 (No. of high gas production wells in parent node: 47956)

**Left split:** 44925 - majority positive class; gini:0.28, **Right Split:** 3031; gini:0.5

(Total value for the next split: 44925)

**Node 2:** Form\_lacking\_NO FORM LACKING <= 2062

**Left split:** 41835 - majority positive class; gini:0.01, **Right Split:** 3090; gini:0.39

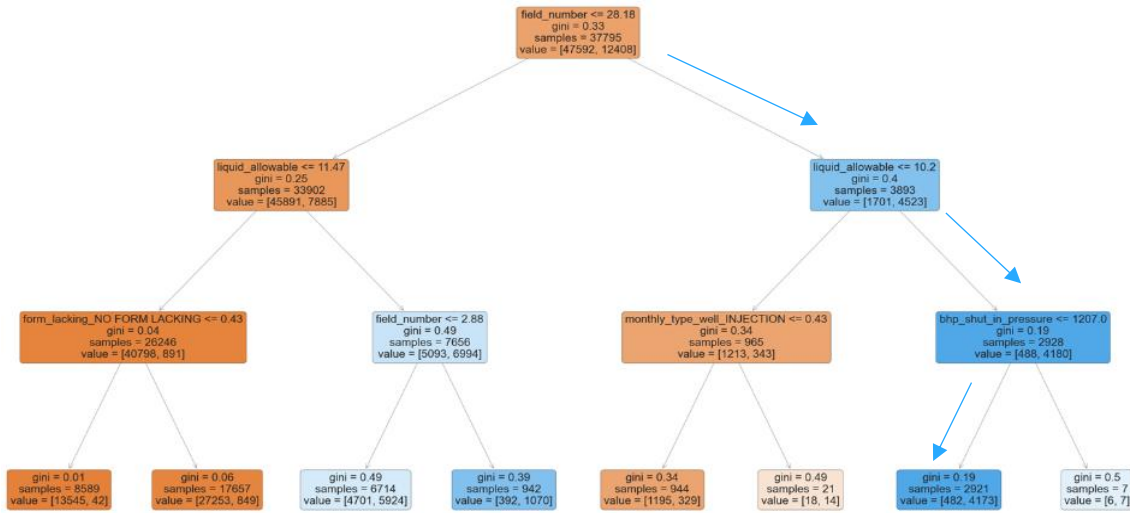
(Total value for the next split: 41835)

**Node 3:** No\_supplement >= 259861.2

**Left split:** 12333; gini:0.02, **Right Split:** 29502 - majority positive class; gini:0.01 – Final Leaf Node.

- ✓ Success Ratio is: **65.66%** (29502/44925) \*100 – (Total value of the positive class in the final leaf node/Total value of the positive class after first split) \*100

**b. Target SXI Decision Tree**



Target SXI from correlation curve for 20% increase in target outcome of high gas production well is **1.93**.

**Interpretation: -**

**Node 1:** Field Number  $\geq 29$  (No. of high gas production wells in parent node: 12408)

**Left split:** 7885; gini:0.25, **Right Split:** 4523- majority positive class; gini:0.4

(Total value for the next split: 4523)

**Node 2:** Liquid allowable  $\geq 10.2$  bbl

**Left split:** 343; gini:0.34, **Right Split:** 4180- majority positive class; gini:0.19

(Total value for the next split: 4180)

**Node 3:** BHP shut-in pressure  $\leq 1207$  kPa

**Left split:** 4173- majority positive class; gini:0.19, **Right Split:** 7; gini:0.50 – Final Leaf Node.

- ✓ Success Ratio is: **92.26%**  $(4173/4523) * 100$  – (Total value of the positive class in the final leaf node/Total value of the positive class after first split) \*100

## Conclusion

- SXI Prediction accuracy is **1.14** times Auto AI prediction accuracy and hence is **14%** superior.
- Wells, whose SXI score is higher than current average SXI score of **1.64** have **40%** higher gas producing rates than overall gas producing rates average of all wells.
- Target **20%** increase in high gas producing wells is achievable by raising target SXI to **1.93** from current **1.64** levels. This would result in **14,842** of high gas producing wells from current 12,368 levels.

Initial Increase from  
current levels:  
**20% or 2,474**

**SXI Impact**  
*Potential*

- Based on the inference from correlation graph w.r.t SXI there is a **potential 84% compounded increase** if all recommendations in target SXI are completely implemented.

Compounding Increase  
from current levels:  
**84% or 10,389**

**SXI Impact**  
*Potential*