Software Product Line: **Mine Pump**

Features of the lift system: **highwater Sensor, low Water Sensor, methane Alarm, methane Query, start Command, stop Command,** **base**

**Comment:**

Alex Answer: “In Analysis\_minepump.ods, you can see that the first specification fails when the features base (must always be enabled) and highWaterSensor are enabled. The defect does not occur when methaneAlarm is enabled in addition. So there is an interaction between highWaterSensor and methaneAlarm. I think for the second specification, it is highWaterSensor and methaneQuery. For the third it might be highWaterSensor and stopCommand. For the fourth, highWaterSensor and lowWaterSensor. And the fifth specification is ok in all variants. So we have these four interactions with respect to these specifications (and some interactions with base if we want to count that as feature).”

**Specification 1**: The pump is never on when there is methane.

"Spec1", "Pump is running while methane is in the Mine."

**Specification 2:** When the pump is running, and there is methane, then it is in switched off at most 1 timesteps.

"Spec2", "Pump continued running while methane is in the Mine."

**Specification 3:** When the water is high and there is no methane, then the pump is on.

"Spec3", "Pump is not running although there is high water and no methane."

**Specification 4:** the pump is never on when the water level is low

"Spec4", "Pump is running although there is low water."

**Specification 5:** The Pump is never switched on when the water is below the highWater sensor.

"Spec5", "Pump was switched on although the water is not high"

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| **Feature Interaction ID** | **Features Involved in the Interaction** |
| 1 | highWaterSensor+ methaneAlarm |
| 2 | highWaterSensor+ methaneQuery |
| 3 | highWaterSensor+ stopCommand |
| 4 | highWaterSensor+ lowWaterSensor |



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| *Known Feature Interaction* | **highWaterSensor+ methaneAlarm (1)** | | | | |
| *Possible new features* |  | | | | |
|  | **highWaterSensor** | | **methaneAlarm** | | |
| ***Similar features by Jaccard*** | lowWaterSensor | | LWS | | |
| *Jaccard Detection* | lowWaterSensor-methaneAlarm | | HWS+LWS | | |
| *True Detection* | no | | yes | | |
| ***Similar feature by Hamming*** | LWS,MQ | | LWS,StopC,MQ | | |
| *Hamming Detection* |  | |  | | |
| *True Detection* | no | no | yes | yes | yes |

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| *Known Feature Interaction* | **highWaterSensor+ methaneQuery (2)** | | | |
| *Possible new features* |  | | | |
|  | **highWaterSensor** | | **methaneQuery** | |
| ***Similar features by Jaccard*** | lowWaterSensor | | MethaneAlarm | |
| *Jaccard Detection* | lowWaterSensor-methaneQuery | | HWS**+** MethaneAlarm | |
| *True Detection* | no | | yes | |
| ***Similar feature by Hamming*** | LWS,MA | | MA,StartC | |
| *Hamming Detection* |  | |  | |
| *True Detection* | no | no | yes | no |

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| *Known Feature Interaction* | **highWaterSensor+ stopCommand (3)** | | | | |
| *Possible new features* |  | | | | |
|  | **highWaterSensor** | | | **stopCommand** | |
| ***Similar features by Jaccard*** | lowWaterSensor | | | methanAlarm | |
| *Jaccard Detection* | lowWaterSensor-methaneAlarm | | | HWS+MA | |
| *True Detection* | no | | | yes | |
| ***Similar feature by Hamming*** | LWS,MQ,MA | | | methanAlarm,startCommand | |
| *Hamming Detection* |  | | | HWS+MA,HWS+StartC | |
| *True Detection* | no | no | no | yes | no |

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| *Known Feature Interaction* | **highWaterSensor+ lowWaterSensor (4)** | | |
| *Possible new features* |  | | |
|  | **highWaterSensor** | | **lowWaterSensor** |
| ***Similar features by Jaccard*** | methaneAlarm | | methanAlarm |
| *Jaccard Detection* | methaneAlarm+LWS | | HWS+MA |
| *True Detection* | no | | yes |
| ***Similar feature by Hamming*** | MQ,MA | | methanAlarm |
| *Hamming Detection* |  | | HWS+MA |
| *True Detection* | no | no | yes |

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| *Known Feature Interaction* | **Encrypt, Autoresponder (8)** | | |
| *Possible new features* | Addressbook, Decrypt, Forward, Sign, Verify | | |
|  | ***Encrypt*** | | ***Autoresponder*** |
| ***Similar features by Jaccard*** | Verify | | Decrypt |
| *Jaccard Detection* | Verify-Autoresponder | | Encrypt-Decrypt |
| *True Detection* | 🗴 | | 🗸 |
| ***Similar feature by Hamming*** | Decrypt Verify | | Decrypt |
| *Hamming Detection* | (Decrypt – Autoresponder) | (Verify– Autoresponder) | Encrypt-Decrypt |
| *True Detection* | 🗸 | 🗴 | 🗸 |

Accuracy (Jaccard)= (14)/(22)= 63%

Accuracy (Hamming)=(15)/(22)=68%

Accuracy (Combined)= (16)/(22)=72%