Hi Dr. Louw,

I managed to speak with the plant manager at Wellington site. He informed me that the RDX explosives plant is the newest and generates the most data. This is based on the Woolwich (Direct Nitration) process.

The general process involves:

1. Generating a nitrating acid (HNO3 and H2SO4)
2. Nitration (of hexamine)
3. Filtration, washing and neutralization
4. Crystallization

I was generally thinking of a project something along the lines of … “*The use of Deep Learning to predict/warn/prevent off-spec key properties in exit streams”*. These 3 main exit streams of the plant are described below.

The prediction could focus on either a single stream or multiple streams. Or a single stream, taking the remaining 2 streams as inputs.

1. **RDX Product**

Crystals, properties of interest:

* Purity (RDX)
* Particle size distribution
* Occluded acid content

The properties are influenced by nitration, filtration, washing and crystallization. Typically difficult to control, off-spec product generally cannot be re-worked and must be sent to the burning grounds which releases harmful combustion products.

**2/3. Nitration Spent Acid & Waste Water**

The spent acid is generated in the nitration process and separated during primary filtration. The wash water is produced during washing and neutralization.  
  
The main properties of interest are:

* Acid concentration
* Dissolved organic content

Variations in spent acid concentration causes damage to downstream tanks and processing equipment and can also affect the solubility of RDX, causing product losses. Organic content, dissolved RDX, can lead to unstable degradation and thermal runaway.

I’m not sure if they directly measure the organic content but I do know that they currently use excess chemical dosing than what is needed in a hit-or-miss kind of situation.

I am leaning towards RDX product, although, the frequency in which batch testing is done will determine how much data is available. Otherwise spent acid and waste water properties are easily measured and Rheinmetall will likely sponsor the sensors if they are not already installed.

I am completely open to any other suggestions you might have, especially if I’ve missed the concept of your research area entirely.