

# Nitrogen Displacement

## Calculations and Procedure

## Introduction

The Nitrogen displacement is a common practice in the pipeline context. It consists in connecting a nitrogen pumper to the pipeline and use the gas pressure to push the product to the receiving depot. Generally, it is used a “pig” to separate the nitrogen from the product.

The procedure permits:

- To clean the pipeline;
- To remove all the products from the pipeline;
- To inert all the pipeline and prepare it for maintenance works.

The most relevant risk of the nitrogen displacement are:

- High pressure in the line (generally above the operating pressures);
- Possible introduction of nitrogen to the receiving tank;
- High velocity of the “pig”, that could compromise its integrity and cause potential waterhammer.

To avoid all the risks and optimize all the parameters it is essential to study carefully the alignment and the process to be performed.

## What do we do

Streamline Engineering is able to provide the calculations and the procedures about the following activities:

- Pig positioning along the line for partial displacement;
- Displacement procedure and calculations;
- Vent and flushing operations;
- Re-filling procedure and calculations.



## Preliminary Analysis

The first step concerns the study of the following data:

- Profile characteristic (elevation vs length);
- Mechanical characteristics of the Pipeline:
  - Material, Diameter and Thickness;
  - Radius of curvature;
  - MAOP/DP;
- Number and types of valves along the line;
- Definition of the valves' CV;
- P&ID analysis;

# Hydraulic Calculations

The process hydraulic calculations allow to define:

- Hydraulic grade line at the different flowrate;
- Nitrogen volume required;
- Nitrogen flowrate and pressure;
- Liquid flowrate to control at the receiving station;
- Pressure along the line and at the receiving station;
- Control point for the pig tracking;
- Multiphase simulation in LEDA FLOW.



