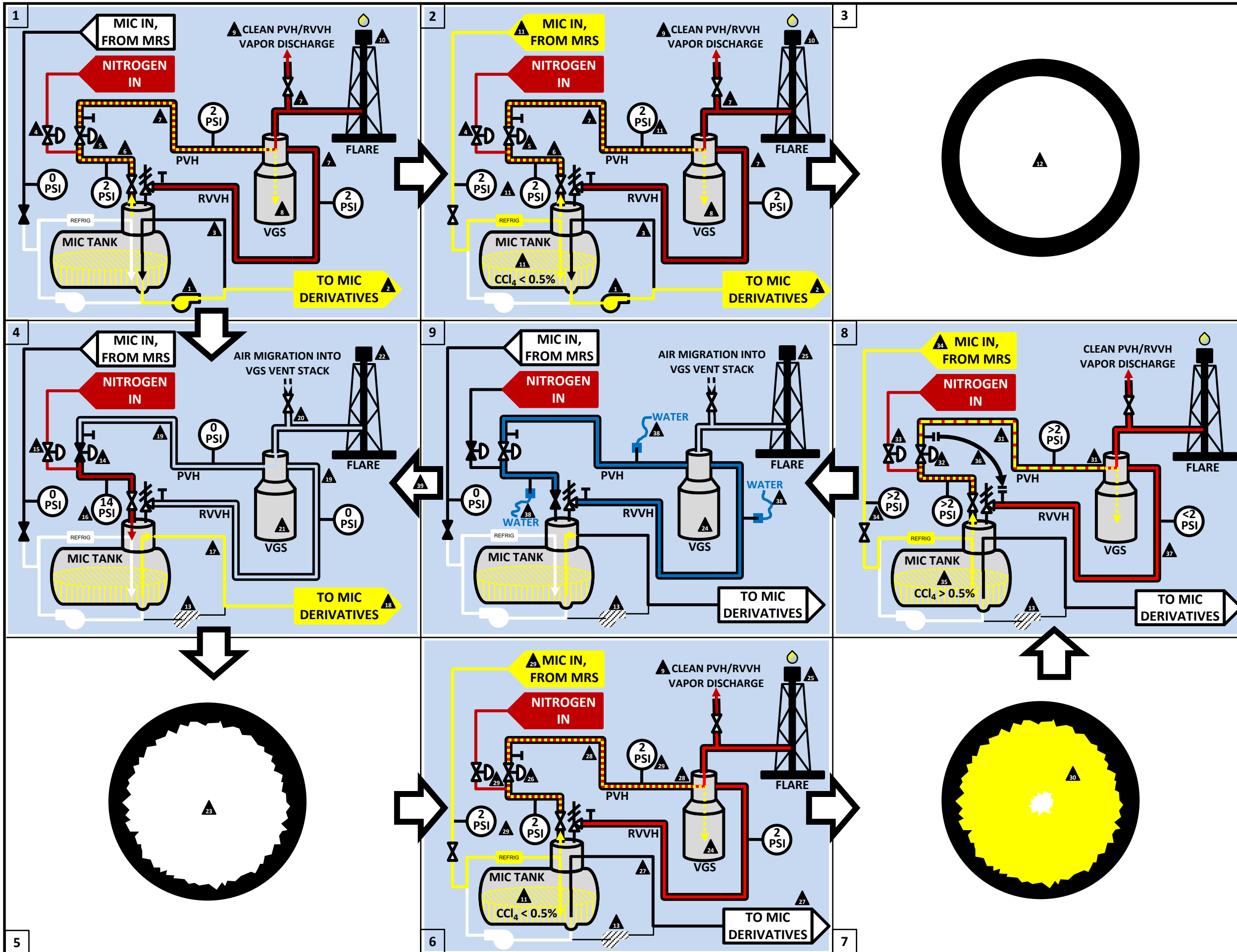


Kenneth Bloch
processreliability@gmail.com



NOTES

SIMPLIFIED PROCESS FLOW DIAGRAM
Only relevant/major equipment shown.

- 1 MIC transfer by design (MIC Transfer Pump)
- ▲ MIC Transfer Pump online
- 2 MIC transfer to Sevin Unit Charge Pot
- ▲ MIC Transfer Pump spillback line
- ▲ Nitrogen (red) Supply Control Valve
- ▲ MIC Tank Vent Control Valve (2 PSI max)
- ▲ MIC tank vapors (yellow) entering the PVH
- ▲ Iron lines, protected by nitrogen flow
- ▲ MIC vapor removal (destruction) in VGS
- ▲ Clean (MIC-Scrubbed) tank vapor emission
- ▲ Continuous excess gas combustion (Flare)
- 2 Design MIC Tank Fill Mode, low pressure
- ▲ On-spec MIC with < 2 PSI MRS backpressure
- 3 PVH/RVVH cross-section view (w/ nitrogen)
- ▲ Smooth and clean internal base-metal
- 4 Alternative MIC transfer method (by dP)
- ▲ MIC Transfer Pump disabled (seal leak)
- ▲ MIC Tank Vent Valve closed to isolate tank
- ▲ Nitrogen fed to raise sealed tank pressure
- ▲ MIC Tank pressure raised to at least 14 PSI
- ▲ MIC reverse-flowed through spillback line
- ▲ MIC to Sevin Unit Charge Pot (pump bypass)
- ▲ Closed vent valve stopped PVH nitrogen flow
- ▲ Air (light blue) migrated into iron vent pipes
- ▲ VGS taken offline (MIC Tank isolated)
- ▲ Flare taken offline (MIC Tank isolated)
- 5 PVH/RVVH cross-section view (no nitrogen)
- ▲ Rough and corroded internal base-metal
- 6 Modified MIC Tank Fill Mode, no pump
- ▲ VGS put online (to receive MIC Tank vapor)
- ▲ Flare put online (MIC Tank unsealed)
- ▲ MIC Tank Vent Valve reopened
- ▲ No MIC transfer possible (open vent valve)
- ▲ Trimer polymer build-up in PVH (rust + MIC)
- ▲ Auto control valve adjustment to keep 2 PSI
- 7 PVH/RVVH cross-section view (choked)
- ▲ Trimer (polymer) deposit accumulation
- ▲ MIC distillation with trimer-fouled PVH
- ▲ PVH vapor traffic restriction (trimer-choked)
- ▲ Maximum MIC Tank Vent Valve output
- ▲ Minimum Nitrogen Supply Valve output
- ▲ Backpressure > 2 PSI on MRS
- ▲ Off-spec MIC, for recovery or disposal (\$\$\$)
- ▲ Jumper PVH to RVVH to restore low pressure
- ▲ Using jumper would expose RVVH to trimer
- 9 System shut down for mandatory cleaning
- ▲ Water injected to restore on-spec MIC
- ▲ Repeat Production-Fouling-Cleaning cycle

UCIL Bhopal India

MIC Storage System

Transfer Pump Reliability Case Study

The Bhopal Medical Appeal

