Ambyint

Plunger Lift Field Guide

What's Inside

Ambyint

How to Use This Guide

This guide is designed to assist operators and engineers in diagnosing and addressing common challenges in plunger lift operations. Here's how to make the most of it:

Identify the Issue: Use the "What's Inside" section to locate the topic related to your well's performance or anomaly (e.g., Miscalibrated or faulty tubing, casing or line transmitters)

Understand the Symptoms: Each section outlines what to look for, including key indicators such as pressure abnormalities.

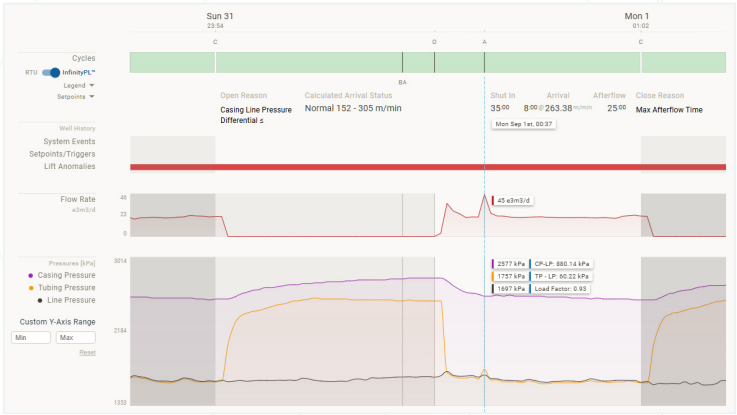
Apply Remediation Steps: Follow the recommended steps provided in each section to address the identified issue. These steps are practical, actionable, and tailored to restore optimal well performance.

Leverage Ambyint Solutions: Use Ambyint's advanced tools, such as Autonomous Setpoint Management (ASPM) and anomaly detection, to implement automated and proactive measures for ongoing well optimization.

Monitor and Learn: Regularly monitor your wells using the insights and tools outlined in this guide to enhance your operational understanding and prevent future issues.

Whether your goal is to optimize production, improve equipment reliability, or troubleshoot specific problems, this guide serves as a comprehensive resource to support your success.

Healthy Plunger Lift Cycle



WHAT A HEALTHY PLUNGER CYCLE LOOKS LIKE

- **Plunger arrival confirmed** by both pressure and flow signature and arrival sensor detection
- **No flow during off-time** — motor valve fully sealed
- **All transmitters calibrated** — tubing, casing, and line pressures within expected ranges
- **Tubing pressure drops** to just above line pressure during On-cycle — no surface restriction
- **Smooth, responsive pressure trends** — no erratic or flat-line readings
- **Cycle timing optimized** — proper shut-in buildup and efficient flow duration

Miscalibrated Transmitter

ANOMALIES DETECTED INDIVIDUALLY FOR

Miscalibrated Line Pressure Transmitter

Miscalibrated Tubing Pressure Transmitter

Miscalibrated Casing Pressure Transmitter

SYMPTOMS

One pressure reading consistently doesn't align with the others.

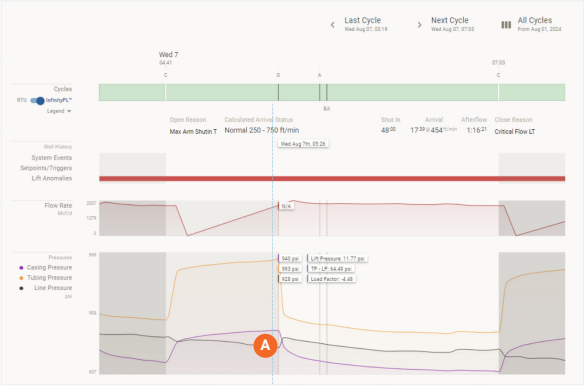
Tubing miscalibration may impact arrival velocity or drawdown detection.

Line miscalibration skews flow delta calculations.

Issue is often subtle — values look believable but don't make sense when compared.

RECOMMENDED ACTION

- [x] Review historical trends to identify the miscalibrated transmitter. Calibrate or replace as needed.



A Casing reads lower than tubing or line, even though the trend through the cycle looks normal.

Leaky Motor Valve

ANOMALIES DETECTED INDIVIDUALLY FOR

Leaky Motor Valve

SYMPTOMS

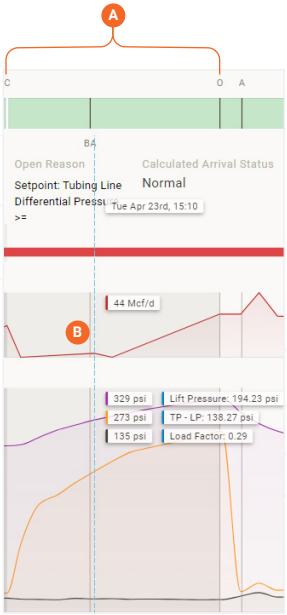
Gas flow is detected on the flow meter during off-time periods when the valve should be closed

Flow readings may be low but continuous, indicating leakage

This can cause reduced well efficiency and inaccurate production measurements

RECOMMENDED ACTION

- [x] Schedule a site inspection to check and repair the motor valve. Replace the valve if leakage persists after maintenance.



A

Offtime represented by the C (Close = Well Shuts in) and ends at the O (Open = Well opens).

B

During the offtime, the well is showing a small amount of gas production (44 Mcf/d).

False Non Arrival

ANOMALIES DETECTED INDIVIDUALLY FOR

False Non-Arrival

SYMPTOMS

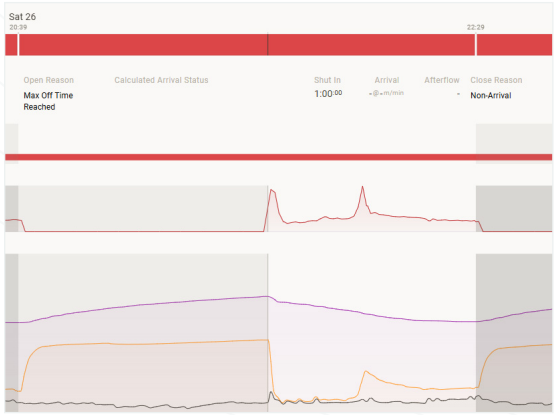
Cycle signature (initial tubing pressure drop and flow response followed by a second spike) clearly indicates a plunger arrival

However, no arrival is recorded by the sensor

Leads to inaccurate cycle reporting and may trigger unnecessary alerts or downtime

RECOMMENDED ACTION

- [x] Inspect the arrival sensor for proper placement, alignment, and sensitivity. Clean or replace the sensor if it's dirty, damaged, or unresponsive.
- [x] Verify plunger is clearing wellhead consistently. Non-Arrivals may be a result of plunger efficiency when attempting to travel through the larger cross-sectional area at the wellhead.



Surface Restriction

ANOMALIES DETECTED INDIVIDUALLY FOR

Surface Restriction

SYMPTOMS

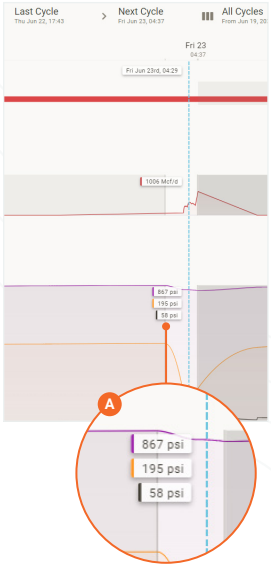
During the On-cycle, tubing pressure does not drop to its typical differential above line pressure

Indicates restricted flow at surface equipment (e.g., partially closed valve, frozen dump line, or restriction at separator inlet)

Can lead to reduced production efficiency and longer cycle times

RECOMMENDED ACTION

- [x] Inspect surface piping and valve configurations for obstructions or partial closures. Check for hydrate, ice debris, or mechanical issues restricting flow. Repair or clear as needed.



A

Here the well is flowing with a tubing-line differential of 137psi (195-58) which is higher than normal over the past 30 days.

Transmitter Communication Failure

ANOMALIES DETECTED INDIVIDUALLY FOR

Communication Failure — Line Pressure Transmitter

Communication Failure — Tubing Pressure Transmitter

Communication Failure — Casing Pressure Transmitter

Communication Failure — Flow Meter

SYMPTOMS

Transducer readings remain unchanged for an extended period.

This may indicate power loss or complete transmitter failure.

RECOMMENDED ACTION

☑ Dispatch a field technician to investigate on site.

A The tubing pressure transmitter value remains unchanged for an extended period.

Faulty Transmitter

ANOMALIES DETECTED INDIVIDUALLY FOR

Faulty Line Pressure Transmitter

Faulty Tubing Pressure Transmitter

Faulty Casing Pressure Transmitter

SYMPTOMS

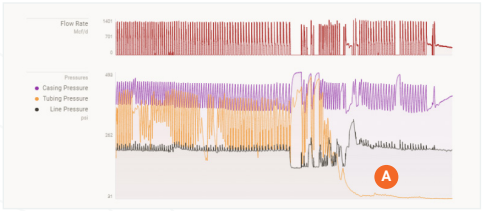
Readings shift from normal cycling to erratic, slow movement (potentially frozen)

Values remain nearly constant but fluctuate subtly and frequently

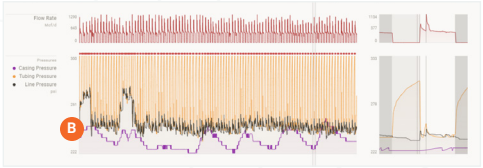
This suggests sensor malfunction rather than communication failure

RECOMMENDED ACTION

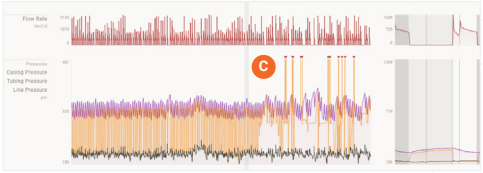
☑ Inspect the transmitter for calibration drift or partial sensor failure. Replace if issue persists.



A
Faulty Tubing Transmitter



B
Faulty Casing Transmitter



C
Faulty Tubing Transmitter

Flow Meter Error

ANOMALIES DETECTED INDIVIDUALLY FOR

Flow Meter

SYMPTOMS

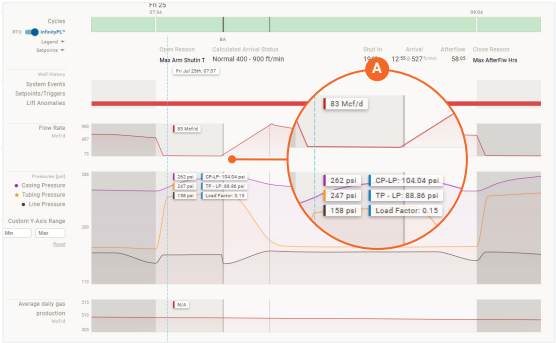
Flow readings remain constant or show little variation over an extended period, despite changes in well conditions

Flow measurements may become erratic or inconsistent with expected production cycles

Sudden spikes or drops in flow readings can occur without corresponding changes in pressure or other indicators

RECOMMENDED ACTION

- [x] Verify flow meter calibration and sensor condition. Inspect for mechanical blockages or sensing line impairment. Blow-down meter, re-calibrate or replace the flow meter as necessary.



A A flow reading (83mcf/d) in the offtime indicating a flow meter error.

Data Requirements Generalized

To enable effective well optimization and autonomous control, the following baseline data requirements should be met:

BASELINE DATA REQUIREMENTS

Interval data
Ideally 5-minute intervals for Flow rate, Casing, Tubing and Pipeline pressure (up to 30-minute acceptable)

Optimization setpoints
Various Close and Open triggers including both pressure and time based controls

Daily cumulative gas volume
Totalized gas volume for each individual well

Cycle data
Including timestamps for Open, Close, and Arrival

Well setup data
Plunger system details including Bumper spring depth and plunger type

Production Target
Planned production target

Ambyint Autonomous Setpoint Management

Our physics-informed AI classifies well optimization states and determines optimal setpoints.

THIS FEATURE INCLUDES

Physics-informed AI calculations

Daily classifications of wells that define optimization strategy

Optimal controller setpoint recommendations for review

Remote or autonomous setpoint updates

User-defined boundaries to ensure the well is always operating within expected limits

Idle time or speed changes to ensure pump efficiency and reliability

Supplemental Information

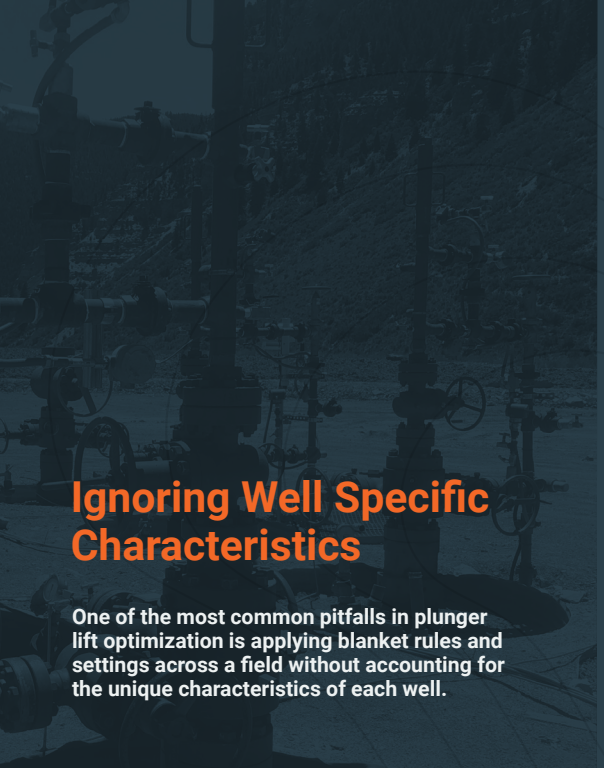
This supplemental information highlights some key mistakes and misses in plunger lift optimization.

Each of these discussion points below can individually, but more importantly when compounded, greatly reduce PL efficiency, production, and equipment lifespan.

This information aims to help understand how you can address each of these, and how Amybint can help you take PL efficiency to the next level with tailored optimization well by well, supporting you team with actionable insights, and freeing up bandwidth for all key players.

TOPICS DISCUSSED

- Ignoring Well Specific Characteristics
- Over Reliance On Manual Manipulation Of Setpoint
- Poor Arrival Sensor Management
- Not Accounting For System Changes
- Not Embracing AI And Ml Tools



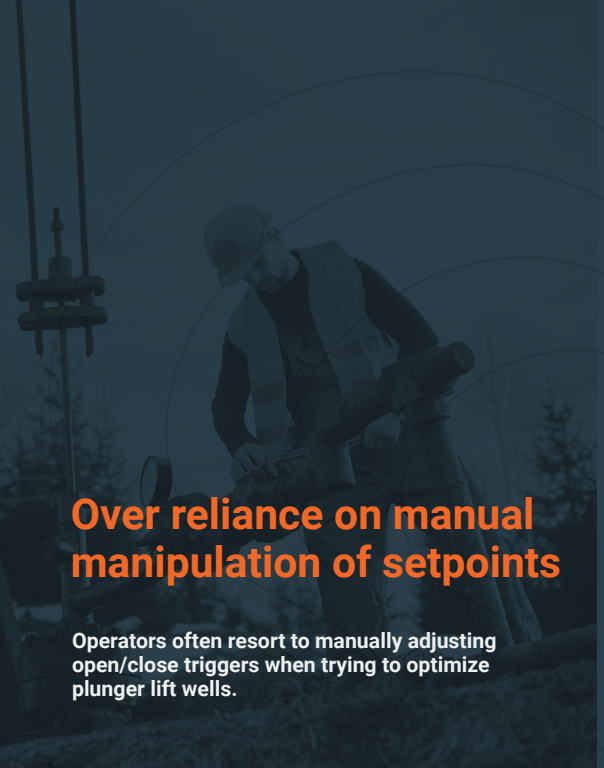
Ignoring Well Specific Characteristics

One of the most common pitfalls in plunger lift optimization is applying blanket rules and settings across a field without accounting for the unique characteristics of each well.

Variables like depth, reservoir and pressure characteristics, plunger type, and pressure characteristics all influence how a well should be cycled. Ignoring these well-specific traits can lead to non-optimized cycles on either end of the spectrum (slow/non arrivals, or fast arrivals), inefficient liquid evacuation, shortened equipment life, lost or deferred production, or in extreme cases well intervention.

Ambyint's InfinityPL system can ingest a wide range of well-specific historical and real-time data to tailor control logic for each asset. InfinityPL learns how each well responds to changes over time and can adapt operating parameters dynamically which eliminates the "one-size-fits-all" approach.

As a result, wells are optimized individually and automatically freeing up valuable time for engineers, well operators, and technicians, maximizing production, and minimizing wear and inefficiencies.



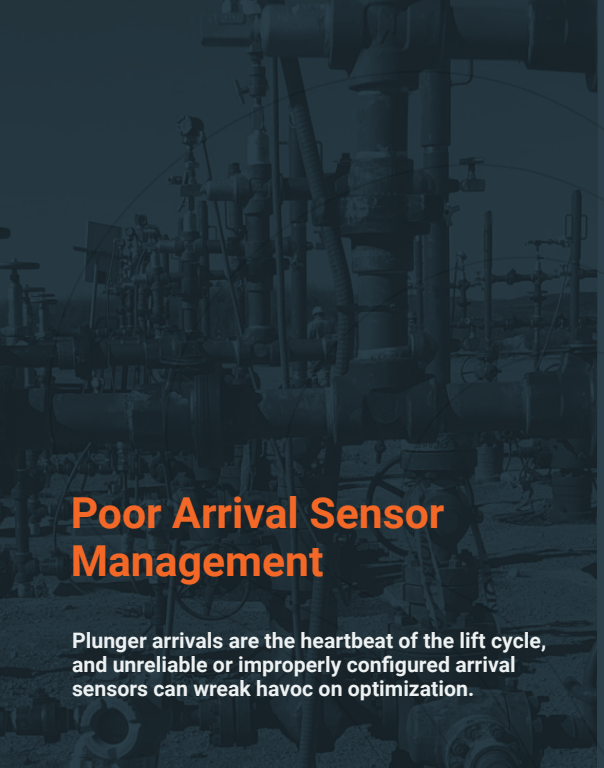
Over reliance on manual manipulation of setpoints

Operators often resort to manually adjusting open/close triggers when trying to optimize plunger lift wells.

While field knowledge is invaluable, frequent manual tuning can introduce inconsistencies, drive suboptimal cycles, and create a time consuming and ineffective cycle of reactive troubleshooting rather than proactive optimization.

Ambyint's InfinityPL platform relieves operators from routine tuning by learning optimal setpoints based on historical patterns, current well conditions, and system behavior, as mentioned above, with our Autonomous setpoint management (ASPM).

While InfinityPL optimizes each plunger well, operators can focus on exception based management utilizing our advanced surveillance and analytics dashboards rather than continuously tweaking each well.



Poor Arrival Sensor Management

Plunger arrivals are the heartbeat of the lift cycle, and unreliable or improperly configured arrival sensors can wreak havoc on optimization.

False arrivals and false non-arrivals can lead to premature shut-ins, extended downtime, and unnecessary well/site visits, all of which reduce efficiency or could lead to a potential safety incident.

Ambyint's InfinityPL Anomaly detection can validate sensor health, and flag anomalous behavior by comparing arrival data to expected trends in rate and pressure.

Early intervention from this and other anomalies available keep your plunger lift system running efficiently, and can also help pinpoint where and when plunger maintenance is most critical.

Not Accounting for System Level Changes

Upstream systems are dynamic and line pressures fluctuate for a number of reasons - compressor downtime, weather events, new TIL's, etc.

Static setpoints or logic that doesn't adapt to these system level events can quickly become stale, not giving your plunger system the desired outcome.

InfinityPL's closed-loop automation continuously monitors line pressure (LP) and can adapt to these changes real-time. By recognizing and adjusting for these evolving conditions, Ambyint's platform ensures the plunger performance remains aligned with the current operating environment.

Not Embracing AL & ML Tools

Some operations still hesitate to adopt AI or ML tools, relying instead on traditional rule-based logic or manual expertise

This hesitation can stall progress, particularly in fields with hundreds or thousands of wells where human bandwidth is stretched thin. Without advanced tools, opportunities to focus on higher value tasks, production gains, cost savings, and improved well health are often left on the table.

Ambyint's goal is not to replace field knowledge, but to amplify it. When onboarding InfinityPL to your plunger assets, it's critical to build trust with your engineers, technicians, and field staff. To support this, the platform offers a recommendation mode prior to activating full ASPM. In this phase, InfinityPL suggests setpoint changes that require user approval before being applied. This collaborative approach gives your team visibility into the system's methods and builds confidence in how and why optimization decisions are made, laying a strong foundation for successful implementation.

GET IN TOUCH

Contact
www.ambyint.com
info@ambyint.com

Toll free: 1 (800) 205-1311

Canada
2360 Portland Street Southeast
Calgary, AB T2G 4M6

U.S.
800 Town and Country Blvd, Suite 500
Houston, TX 77024

Ambyint

ABOUT AMBYINT

Ambyint is dedicated to supporting upstream oil and gas companies through our proven AI-powered production optimization platform. Our focus on expanding capacities across personnel and production, while improving safety and sustainability reflects our commitment to addressing critical industry challenges.

By prioritizing operational issues and enabling autonomous well control, we help lean production teams to optimize every well, every day. With nearly 200,000 BOE/D managed on our platform, companies consistently achieve production gains, cost savings, and emissions reductions. Our team in Houston and Calgary stands ready to assist producers across North America with harnessing the power of AI to advance the energy industry's progress toward a more sustainable future.