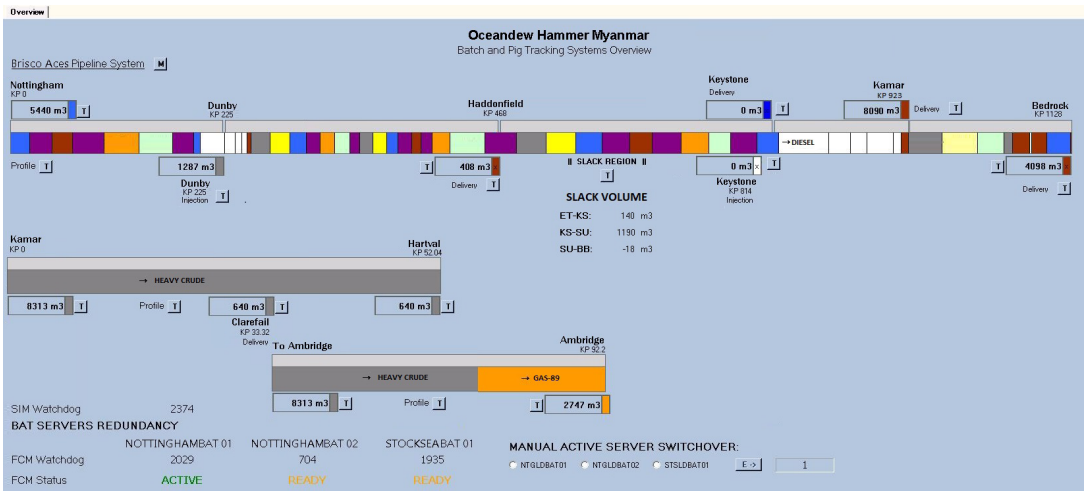
Atmos Batch

The most accurate batch-tracking tool on the market, uniquely effective for long pipelines with large elevation changes and prominent vapor pockets

With Atmos Batch, a pipeline operator knows for certain the location of the head and tail of every batch in a multiple product pipeline to swing valves with confidence at the time they arrive at their destination. An accurate visual display reports batch details and other valuable information to the commercial department, helping to optimize sales revenues.

Features

- Real-time tracking of batch sizes and movements from their injection to partial or full delivery
- Real-time calculation of the batch 'Head' and 'Tail' positions reported in distance and volume units from main inlet
- Real-time Estimated Time of Arrival to all subsequent stations or points-of-interest along the route
- Real-time distance from main injection and to all subsequent stations or points-of-interest
- Real-time volume from main injection and to all subsequent stations or points-of-interest
- Works on bi-directional pipelines
- Unaffected by changes in pipeline conditions such as stoppage, restart, or flow reversal
- Calculates and tracks interface mixing between products of different properties
- Smart and automatic, batch-scheduled import tool via OPC
- Smart and manual, batch-scheduled import tool via CSV or user interface
- Controlled delivery of fungible products
- Real-time tracking of drain/fill volumes
- Real-time tracking of slack volume in regions with significant elevation changes
- Comprehensive, intelligent reports for arrival, custody, and inline content

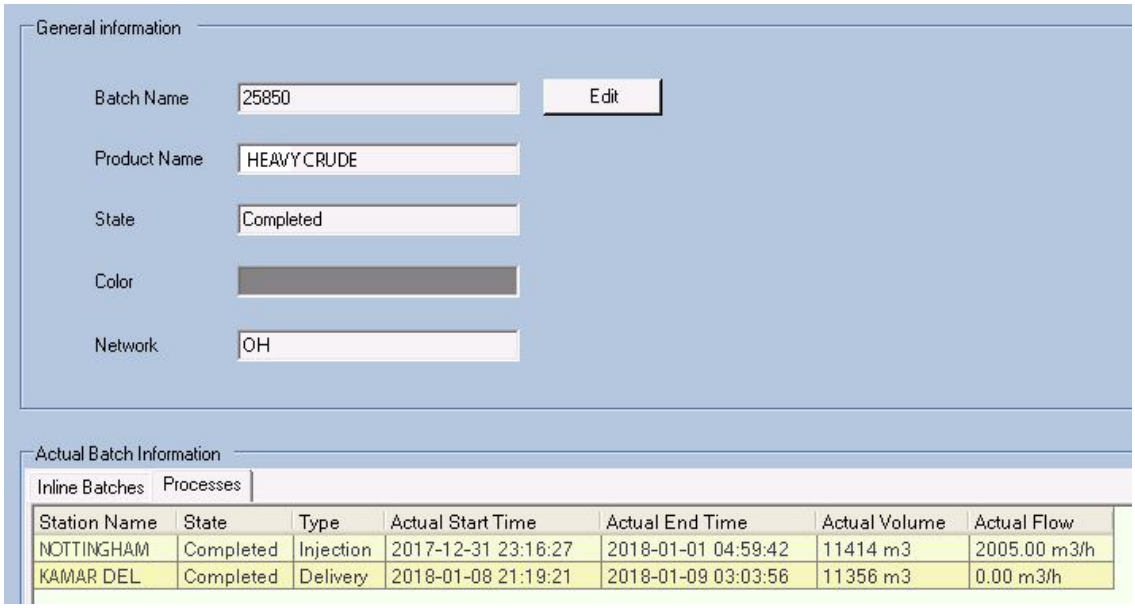


System overview display highlights valuable information

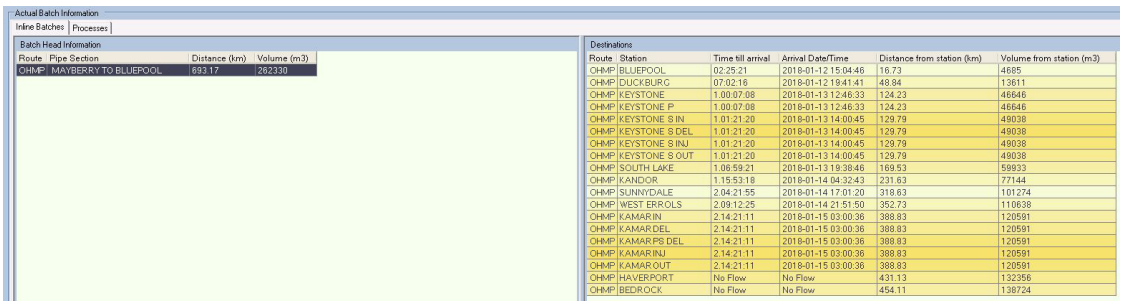
Why Atmos Batch is better?

It is relatively simple to track multiple batches in a pipeline with no elevation changes and a fixed internal diameter. However, it is far more complex to track multiple batches in a pipeline with significant elevation changes and different sizes in diameter. When pipeline operational variables fall below the liquid critical point, column separation occurs. This phenomenon changes the liquid volume contained within a pipeline, affecting the physical locations of the batches and their ETAs at subsequent stations. Draining or filling a pipeline has the same effect. Atmos Batch calculates the volume contained within a pipeline by tracking the volume injected and using known properties, without additional theoretical assumptions that add unnecessary complexity and uncertainties. This unique approach assures a more accurate, reliable, and robust system. Even when a batch has traveled over 1,000km (624 mi) through drastic elevation changes, the ETA has proven to be accurate to within minutes.

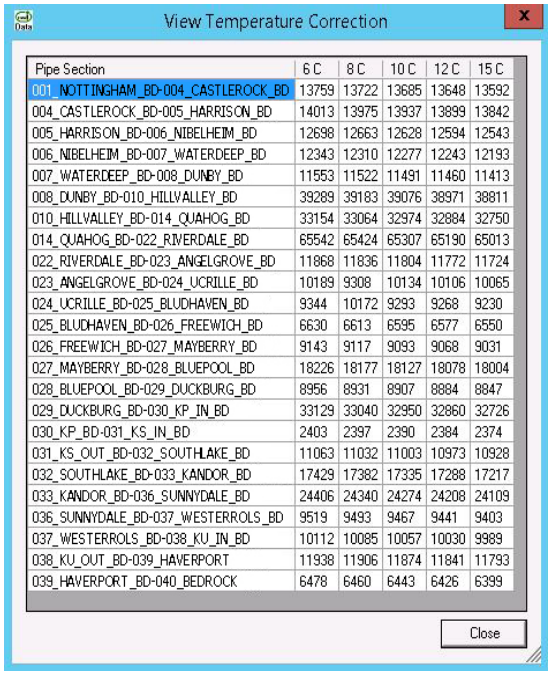
Atmos Batch identifies batch injections from many indicators, such as valve movement or other instrumentation and process changes. The physical volume of the pipeline and fluid velocity is used to estimate batch time of arrival at subsequent stations.



Batch general information



Batch estimated time of arrival, distance, and volume to upcoming stations



Pipe Section	6 C	8 C	10 C	12 C	15 C
001_NOTTINGHAM_BD-004_CASTLEROCK_BD	13759	13722	13685	13648	13592
004_CASTLEROCK_BD-005_HARRISON_BD	14013	13975	13937	13899	13842
005_HARRISON_BD-006_NIBELHEIM_BD	12698	12663	12628	12594	12543
006_NIBELHEIM_BD-007_WATERDEEP_BD	12343	12310	12277	12243	12193
007_WATERDEEP_BD-008_DUNBY_BD	11553	11522	11491	11460	11413
008_DUNBY_BD-010_HILLVALLEY_BD	39289	39183	39076	38971	38811
010_HILLVALLEY_BD-014_QUAHOG_BD	33154	33064	32974	32884	32750
014_QUAHOG_BD-022_RIVERDALE_BD	65542	65424	65307	65190	65013
022_RIVERDALE_BD-023_ANGELGROVE_BD	11868	11836	11804	11772	11724
023_ANGELGROVE_BD-024_UCRILLE_BD	10189	9308	10134	10106	10065
024_UCRILLE_BD-025_BLUDHAVEN_BD	9344	10172	9293	9268	9230
025_BLUDHAVEN_BD-026_FREEWICH_BD	6630	6613	6595	6577	6550
026_FREEWICH_BD-027_MAYBERRY_BD	9143	9117	9093	9068	9031
027_MAYBERRY_BD-028_BLUEPOOL_BD	18226	18177	18127	18078	18004
028_BLUEPOOL_BD-029_DUCKBURG_BD	8956	8931	8907	8884	8847
029_DUCKBURG_BD-030_KP_IN_BD	33129	33040	32950	32860	32726
030_KP_BD-031_KS_IN_BD	2403	2397	2390	2384	2374
031_KS_OUT_BD-032_SOUTHLAKE_BD	11063	11032	11003	10973	10928
032_SOUTHLAKE_BD-033_KANDOR_BD	17429	17382	17335	17288	17217
033_KANDOR_BD-036_SUNNYDALE_BD	24406	24340	24274	24208	24109
036_SUNNYDALE_BD-037_WESTERROLS_BD	9519	9493	9467	9441	9403
037_WESTERROLS_BD-038_KU_IN_BD	10112	10085	10057	10030	9989
038_KU_OUT_BD-039_HAVERPORT	11938	11906	11874	11841	11793
039_HAVERPORT_BD-040_BEDROCK	6478	6460	6443	6426	6399

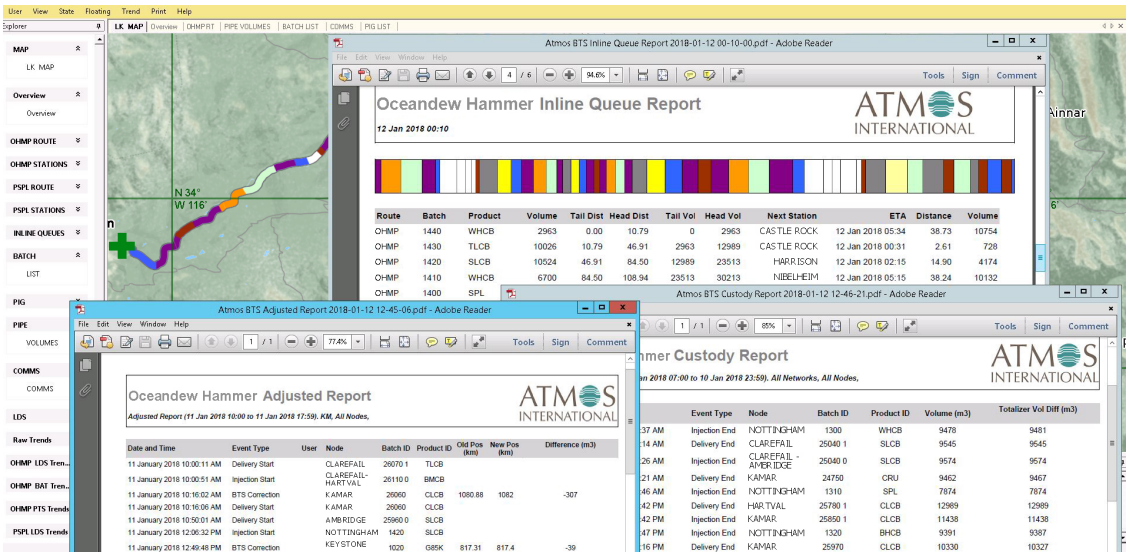
Temperature-volume correction table

Manual temperature/volume correction allows the user to adjust the pipeline's internal volume to match specific ambient temperature conditions for seasonal changes, improving batch tracking accuracy all year around.

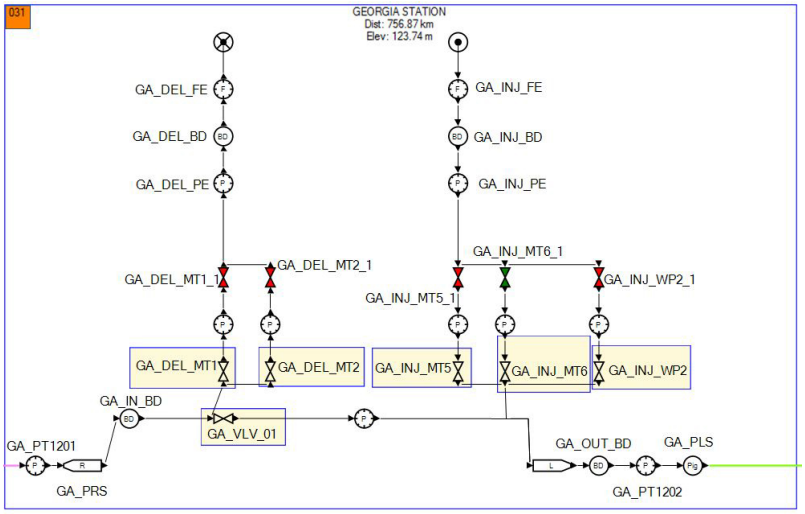
Atmos Batch differentiates the start and end of batches from operating conditions such as, but not limited to:

- **Valve movements and alignment**
- **Density readings from dedicated instrumentation**
- **Color dye recognition by dedicated Optical Interface detectors and colorimeters**
- **Manual inputs from the controller using the Atmos user interface**

The operations team can access every report needed to compare and review the progress of current and past batches via the intuitive reporting tool.



Atmos Batch Reports

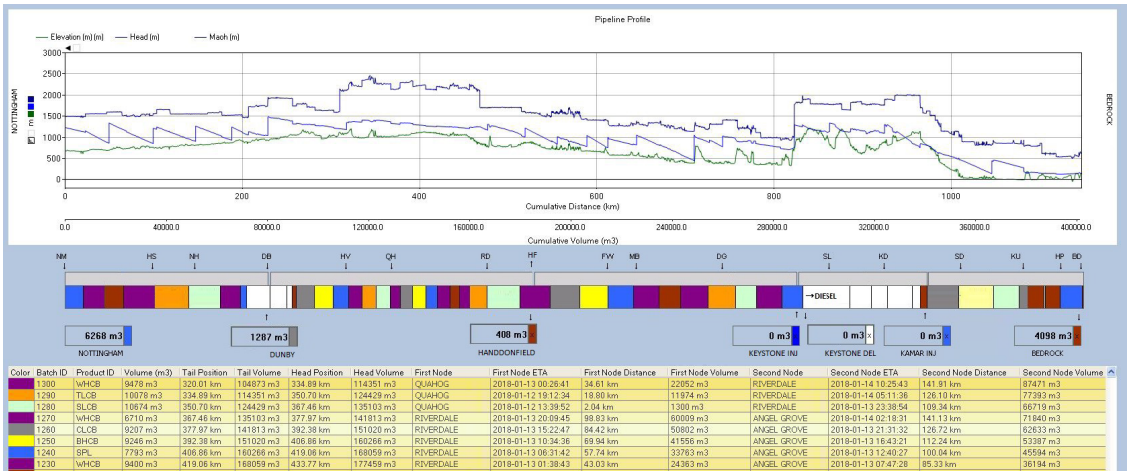


Station configuration engineered in Atmos SIM

Batch tracking takes advantage of a real-time transient model to optimize its accuracy as operating conditions change. Atmos Batch can be configured as a full model, or as an incompressible model, depending on the industry, operation, and fluid type. Atmos SIM's unique Maximum Likelihood State Estimator (MLSE) uses available flow and pressure data to provide a highly-accurate calculation of the hydraulics and composition of products in a pipeline in real-time, while the Tuning Assistant keeps the model as close to reality as possible. Atmos Batch is a module of Atmos SIM and uses the same schematic as the pipeline model, Atmos SIM leak detection, and Atmos Pig.

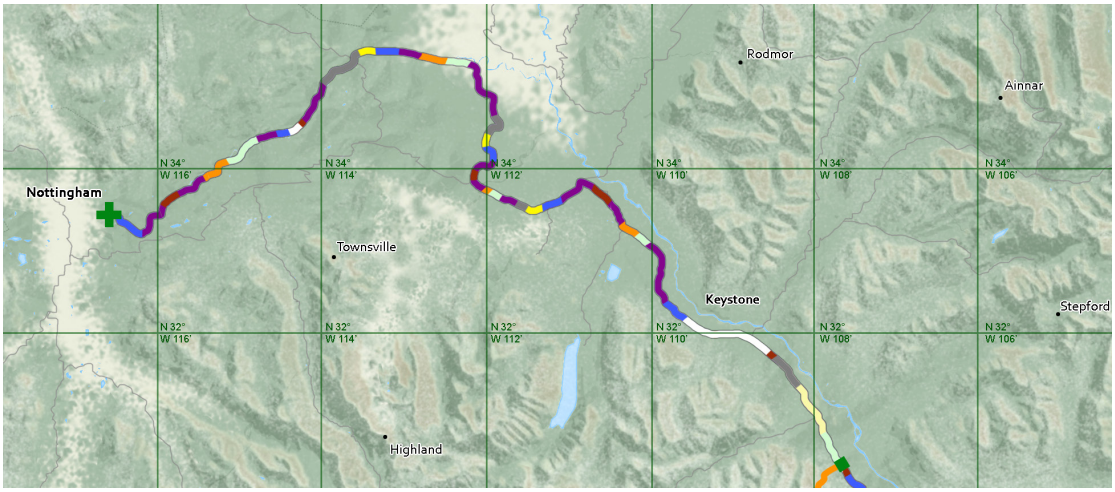
Atmos Batch displays the batch lineup information along with the corresponding maximum and lowest allowable pressure and head pressure, calculated pressure, dynamic head pressure, and elevation concerning the pipeline distance profile.

The display coordinates the colors of the batches, allowing the operators to distinguish the products easily.



Color	Batch ID	Product ID	Volume (m3)	Tail Position	Tail Volume	Head Position	Head Volume	First Node	First Node ETA	First Node Distance	First Node Volume	Second Node	Second Node ETA	Second Node Distance	Second Node Volume
	1300	WHCB	9478 m3	320.01 km	104873 m3	334.89 km	114351 m3	QUAHOG	2018-01-13 00:28:41	34.61 km	22952 m3	RIVERDALE	2018-01-14 10:25:43	141.91 km	87471 m3
	1290	TLCB	10078 m3	334.89 km	114351 m3	350.70 km	124429 m3	QUAHOG	2018-01-12 19:12:34	18.80 km	11974 m3	RIVERDALE	2018-01-14 05:11:36	126.10 km	77393 m3
	1280	SLCB	10674 m3	350.70 km	124429 m3	367.46 km	135103 m3	QUAHOG	2018-01-12 13:39:52	2.04 km	1300 m3	RIVERDALE	2018-01-13 23:38:54	109.34 km	66719 m3
	1270	WHCB	6710 m3	367.46 km	135103 m3	377.97 km	141813 m3	RIVERDALE	2018-01-13 20:09:45	98.83 km	60099 m3	ANGEL GROVE	2018-01-14 02:19:31	141.13 km	71840 m3
	1260	CLCB	9207 m3	377.97 km	141813 m3	392.38 km	151020 m3	RIVERDALE	2018-01-13 15:22:47	84.42 km	50802 m3	ANGEL GROVE	2018-01-13 21:31:32	126.72 km	62633 m3
	1250	BHCB	9246 m3	392.38 km	151020 m3	406.86 km	160266 m3	RIVERDALE	2018-01-13 10:34:36	69.94 km	41556 m3	ANGEL GROVE	2018-01-13 16:43:21	112.24 km	53387 m3
	1240	SPL	7793 m3	406.86 km	160266 m3	419.06 km	168059 m3	RIVERDALE	2018-01-13 06:31:42	57.74 km	33763 m3	ANGEL GROVE	2018-01-13 12:40:27	100.04 km	45594 m3
	1230	WHCB	9400 m3	419.06 km	168059 m3	433.77 km	177459 m3	RIVERDALE	2018-01-13 01:38:43	43.03 km	24363 m3	ANGEL GROVE	2018-01-13 07:47:28	85.33 km	36194 m3

Hydraulic profile, and graphical and tabular, display for batches in a long pipeline with drastic elevation changes



Batches on a map

System outputs

- Batch and product identifiers
- Color-coordinated batch head and tail location per product type by distance and volume
- ETAs to subsequent stations and any intermediate point, including points without instrumentation
- Arrival distance alarm
- Arrival time alarm
- Arrival volume alarm
- Scheduled/upcoming batch injection/delivery time alarm
- Actual arrival alarm
- Interface tracking and volume growth
- Historical archiving and reporting of Actual Time of Arrival for every batch
- Arrival, custody, and inline reports in PDF, CSV, and Excel format
- Automatic generation of inline report in CSV format for a specific time and location for accounting purposes

Sensors used

- Flow meters at inlets and outlets of the pipeline
- Flow totalizers at inlets and outlets of the pipeline
- Batch ID, and Product ID at injections and deliveries. Typically associated with flow instrumentation (Optional)
- Pressure sensors (Optional)
- Density meters, optical interface detectors, or colorimeters (Optional)
- Valve and pump status (Optional)
- Ambient temperature sensors (Optional)

Data sources

- SCADA, DCS, PLC, or RTU

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ATMOS INTERNATIONAL

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About Atmos International

Atmos International (Atmos) provides pipeline leak detection and simulation technology to the oil, gas, water and associated industries. The company was founded in 1995 in the UK by the inventor of the statistical pipeline leak detection system – Atmos Pipe, now one of a suite of leak and theft detection solutions from Atmos. These technologies are realized on hundreds of pipelines in over 50 countries, including major oil and gas companies such as Shell, BP, ExxonMobil, and Total. With associated offices in the USA, China, Russia, Singapore and Costa Rica, and local agents in 28 countries, the multi-cultural and multilingual team can provide adequate support all over the world.

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