tetrascience

Solution Brief

Chromatography Insights: Transforming your enterprise-wide chromatography data into actionable intelligence

Chromatography is a cornerstone of therapeutics development, accounting for over half of analytical data generated in biopharmaceutical organizations. Yet, labs struggle with fragmented data trapped in multiple chromatography data systems (CDSs), projects, and sites. This leads to slow and purely retrospective analyses that yield limited insights for stakeholders. The consequences are costly: delayed product releases, diminished productivity, and potential compliance risks.

Solution Overview

Chromatography Insights is the industry's first universal chromatography dashboard, compatible with all major CDSs. It consolidates method, column, and instrument performance data into an interactive dashboard within the Tetra Scientific Data and AI Cloud™, providing near real-time insights without the need for additional visualization tools.

Engineered for enterprise scale, Chromatography Insights visualizes tens of millions of recent and historical injections with minutes-level latency. This supports robust process control and proactive monitoring to detect deviations, including out-of-specification (OOS) events, before they occur.

Built on best practices informed by extensive customer feedback, Chromatography Insights redefines how chromatography data is managed and analyzed across the biopharma value chain.

Key Features

Multi-CDS Support

Seamless integration across all CDS platforms for comprehensive data visibility

Enterprise-Ready

Scalable to handle large datasets at minutes-level latency, making it suitable for all groups, labs, and sites in a biopharma organization

Full Data Visibility

Access to historical and recent data for proactively monitoring data trends as they emerge

Proven Impact

1. **Increases productivity and data Integrity**
   - Automates data collection and analysis, reducing manual handling and freeing scientists to focus on value-added tasks.
   - Ensures data accuracy, reliability, and traceability, forming a solid foundation for informed decision-making and AI model development.
2. **Reduces out-of-spec events by up to 75% through enhanced process control**
   - Tracks performance trends across samples, methods, and instruments, enabling early detection and resolution of issues.
   - Supports proactive process control, reducing OOS events and maintaining product quality.
3. **Improves compliance and risk management**
   - Surfaces critical compliance metrics, such as injection counts and standard operating procedure (SOP) adherence, streamlining audits and reducing risk.
   - Minimizes manual checks, streamlining regulatory compliance and increasing confidence in data quality.
4. **Lays the groundwork for AI and ML**
   - Leverages historical and real-time data for developing robust AI models, supporting method optimization and predictive insights.
   - Facilitates strategic decision-making, aligning with long-term goals for digital transformation and advanced analytics.

Benefits by Functional Area

Role	Outcomes with Chromatography Insights
Analytical Development	Deliver consistency and accelerate tech transfer with comprehensive method performance visibility across groups and sites, ensuring method robustness through proactive insights and predictive modeling. Learn more
Quality	Conduct smooth audits with centralized data access, quickly identifying potential compliance issues. Use unified batch performance data to detect trends early and prevent costly delays from deviations. Learn more
Digital Transformation and Data	Centralize and engineer chromatography data across systems and sites to accelerate digital transformation and lay the foundation for AI adoption, driving strategic decision-making. Learn more

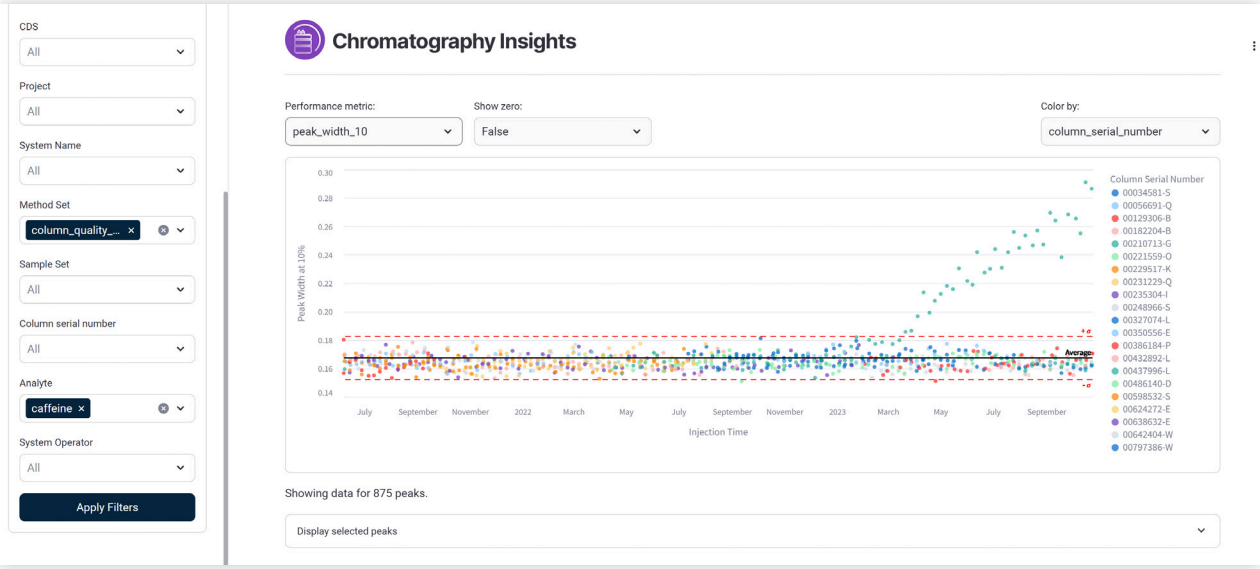
Analytical Development

Challenges

Analytical teams spend hours and often face difficulties in troubleshooting issues due to fragmented data across chromatography systems, which can lead to delayed responses, costly rework, and inconsistent method performance during tech transfer.

Transform Your Operation

- **Proactive Monitoring of Method Performance:** The platform's comprehensive visualization capabilities allow you to detect subtle changes in method performance before they escalate into failures. This proactive monitoring supports timely adjustments, keeping methods within specifications and ensuring process reliability. By achieving consistent assay performance, you increase the likelihood of successful tech transfers, whether horizontally or vertically.
- **Rapid Troubleshooting:** Chromatography Insights provides a comprehensive view of both current and historical datasets, enabling you to quickly detect issues and identify their root causes. With intuitive filtering and trend analysis in the dashboard, you can easily examine variables and uncover correlations to troubleshoot effectively.
- **Cost Reduction and Improved Resource Efficiency:** Chromatography Insights facilitates preemptive issue identification and resolution of potential deviations, significantly reducing the need for extensive investigations and rework. This not only cuts costs associated with failed assays but also helps you make more efficient use of lab resources, allowing your team to focus on value-added tasks like method optimization.
- **Data-Driven Continuous Improvement:** With Chromatography Insights, you can track performance trends across batches, systems, and sites, supporting the continuous improvement of your methods. You can use these insights to refine SOPs, optimize workflows, and enhance overall method reliability. The platform also lays a foundation for predictive modeling and AI-driven decision-making, enabling you to develop more robust, future-ready methods that adapt to evolving analytical needs.



Chromatography Insights helps you quickly diagnose assay issues by visualizing key metrics like peak width. Here, historical data shows a drift toward out-of-specification that correlates with a specific column, indicating the need for a replacement to avoid potential failures.

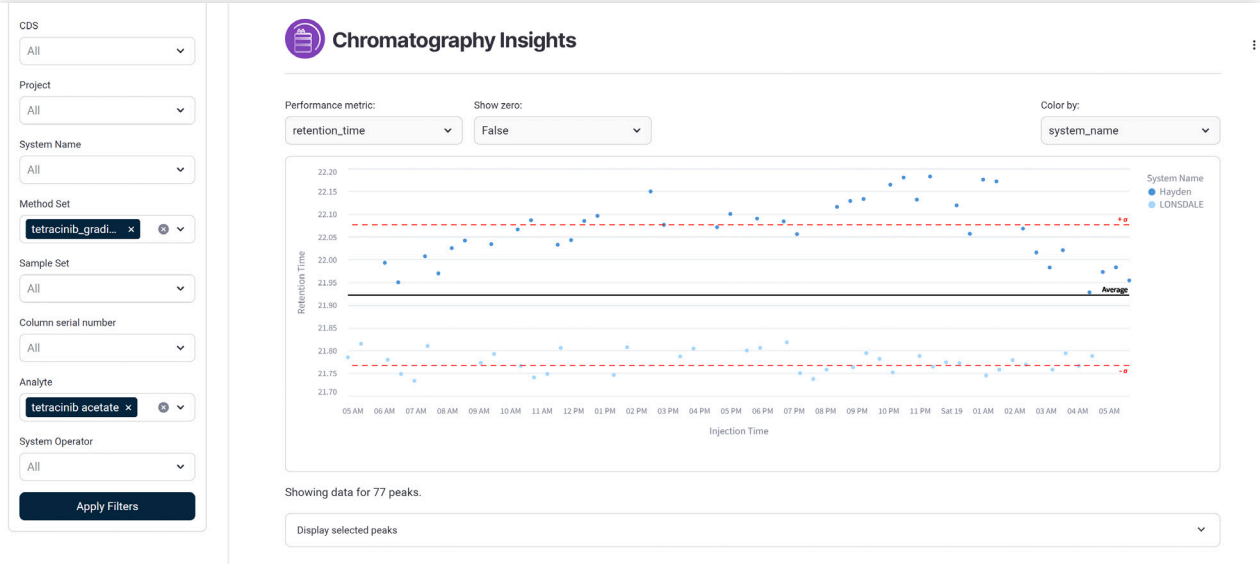
Quality

Challenges

Fragmented data across labs—especially when different CDS platforms and versions are involved—complicates quality testing, compliance, audit readiness, and root cause analysis. This increases the risk of costly delays and safety issues.

Drive Quality Excellence

- **Proactive Monitoring of Product Quality:** Chromatography Insights offers a centralized view of chromatography data across batches of drug substances and products. This dashboard allows you to identify trends in product quality even when they remain below reporting thresholds. For example, you can detect a gradual increase in impurity levels, signaling potential issues like aging reactors, insufficient cleaning, or the degradation of solvents over time. This early detection supports proactive quality management by enabling you to take corrective measures before impurities exceed regulatory limits, thereby preventing non-compliance, production delays, and potential safety risks.
- **Improved Batch Consistency and Release:** Tracking impurity trends alongside system suitability and main peak stability provides a comprehensive view of batch quality. Chromatography Insights enables continuous monitoring of critical metrics, such as purity percentage, across injections, allowing you to identify potential deviations early and ensure consistent product quality.
- **Enhanced Compliance and Audit Readiness:** Chromatography Insights consolidates data from multiple laboratories, even when different CDSs and instruments are in use, providing a unified view that simplifies compliance monitoring and audit readiness. This centralized access allows you to organize and review critical data in advance to audits. It also supports more efficient responses during audits, as you can swiftly retrieve and verify compliance data. Altogether, it improves confidence in your data quality and strengthens your compliance posture.
- **Rapid Identification of Anomalies:** The platform enables you to detect meaningful variations in performance metrics, which can indicate underlying method issues. For instance, if one lab shows a higher number of repeat injections than others, Chromatography Insights can quickly surface this discrepancy and help you investigate and solve it.



Chromatography Insights enables you to quickly spot trends. In this example, data for the "Hayden" system shows a temporal pattern: retention times were higher at night compared to daytime. Further investigation revealed a broken air conditioning unit was at fault.

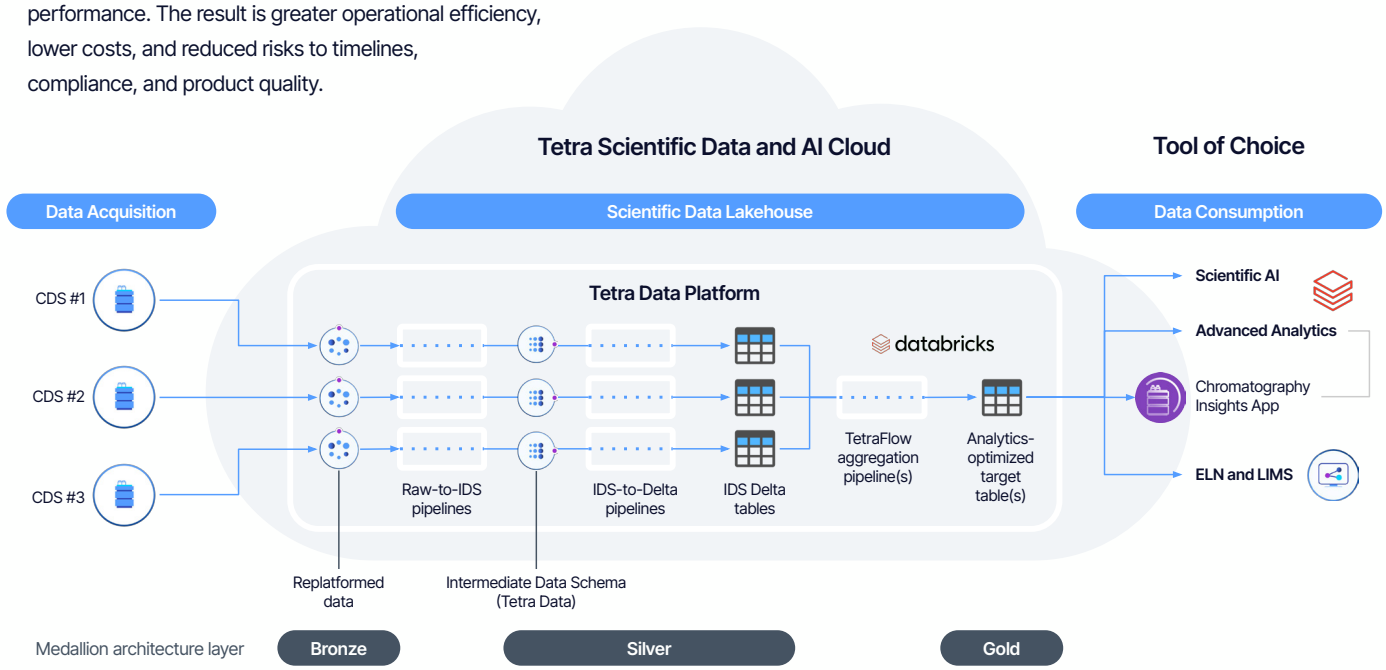
Digital Transformation and Data

Challenges

Chromatography data silos hinder digital transformation by complicating integration and automation and limiting the use of analytics and AI tools. Traditional data management often leads to slow, error-prone data handling and analysis, ultimately impeding impactful business outcomes.

Build a FAIR, AI-Ready Data Foundation

- **FAIR Data Made Easy:** Chromatography Insights automatically centralizes, contextualizes, and harmonizes data across CDSs, fully supporting the principles of FAIR (findable, accessible, interoperable, reusable) data. This enhances data integrity and maximizes value by making data easier to find and reuse across your teams.
- **Better Business Outcomes with AI/ML Acceleration:** By consolidating real-time and historical chromatography data, Chromatography Insights empowers your teams to unlock deeper insights through predictive modeling. These models could detect early signs of instrument malfunctions, recommend timely column replacements, and suggest method adjustments to improve performance. The result is greater operational efficiency, lower costs, and reduced risks to timelines, compliance, and product quality.
- **Scalable Data Foundation:** The data architecture behind Chromatography Insights provides seamless access to optimized, analytics- and AI-ready datasets directly within your preferred tools. Your IT and data teams can easily customize or build data pipelines, applying filters and business logic to meet your organization's needs. With registration in multiple catalogs, such as Databricks' Unity Catalog or Snowflake's Iceberg, there's no need for data duplication or movement. This ensures your teams always have up-to-date data at their fingertips, enabling timely, data-driven decisions.



See how Chromatography Insights can accelerate and improve your scientific outcomes.

Get a Demo

Chromatography Insights is powered by a data lakehouse with medallion architecture. The data journey begins with the Tetra Scientific Data and AI Cloud collecting raw data from CDSs. This data is engineered into Tetra Data according to an Intermediate Data Schema (IDS). For efficient querying and deeper analysis, IDS data is converted into Delta tables via Databricks. Finally, a TetraFlow pipeline creates specialized Delta tables optimized specifically for the Chromatography Insights app, enabling rapid and scalable data insights.