Digitalization as an enabler for performance & decabornization in the steel industry

FOUNDATION

Vision – Our Tomorrow's Future

Vision 2030

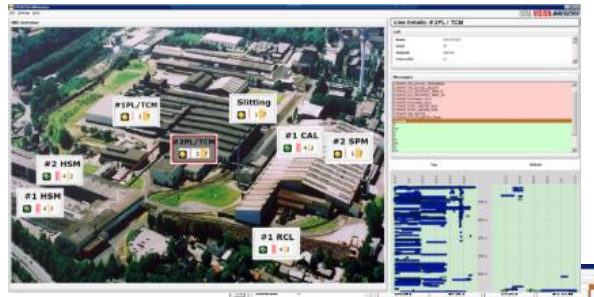
- To be the Service Provider 5.0 – keeping our leading position
- Continues move from a system supplier to a reliable and trustful data information supplier
- Cloud Solutions across all business units – in direction "we drive your system"
- Artificial Intelligence program towards process optimization and full automated decisions based on customer defined rules

Integrated Software Portfolio

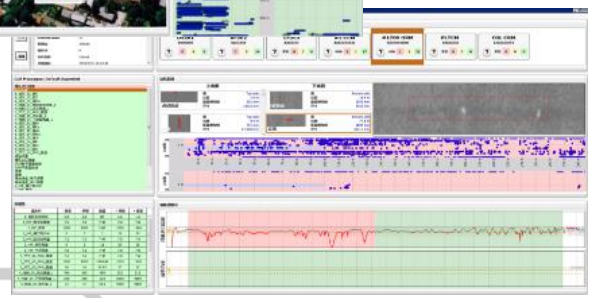
Driving the Industrial Digital Transformation

Condition Monitoring

Quality management solutions

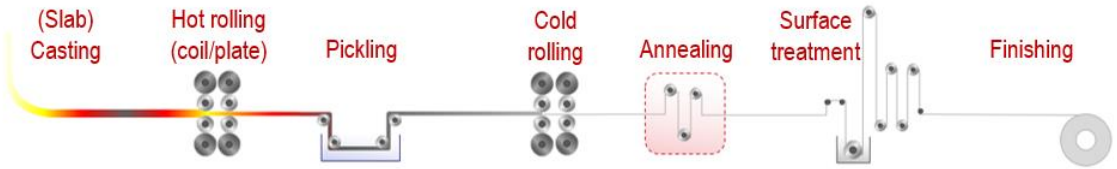


MillMonitor

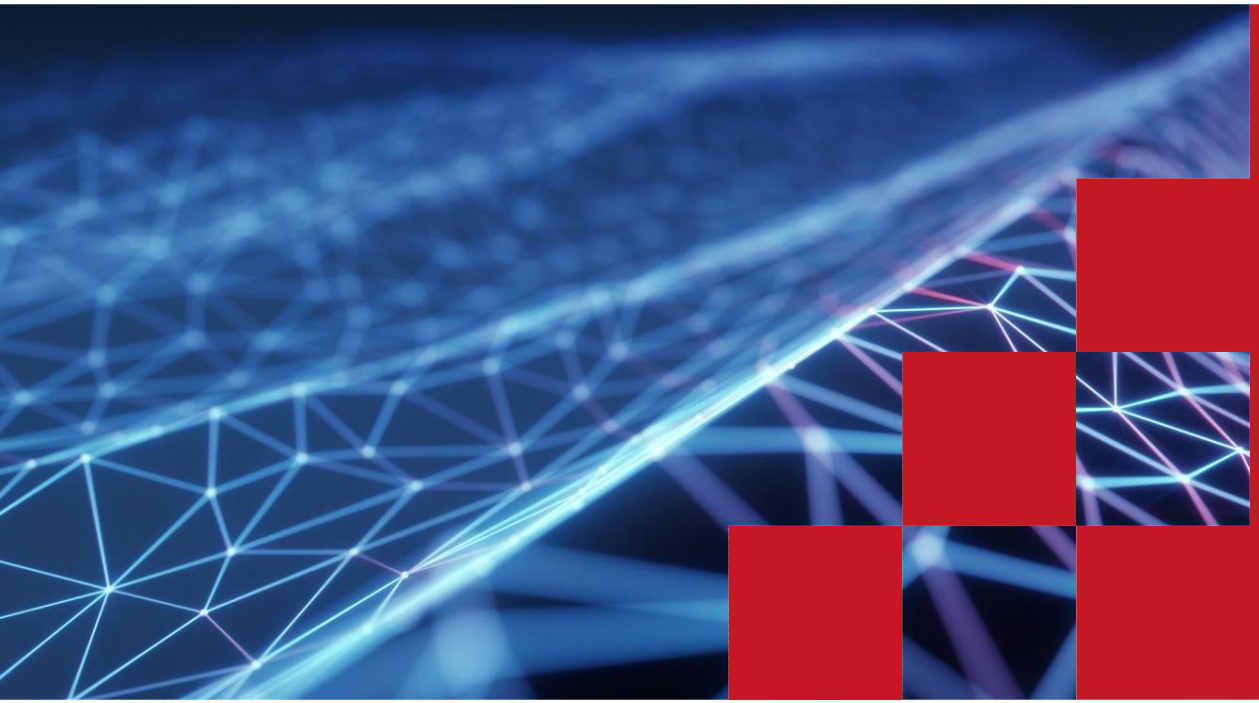


ProcessView

Process control data



Inspection data



Project Goals

Looking behind Performance & Quality Management

parsytec

Zero Defect Strategy

Goals

- Block defective material
- Block material that will fail in the next production steps
- Real-time alarms on (predicted) quality deviations
- Recommend adapted process parameters or rerouting to bring the material back to proper quality
- Reduce the required surplus material to fulfill customer orders (OTIF)

Advantages

- Less claim costs
- Better usage of existing production
  → increased throughput
- Optimized processes
  → Less scrap and investment into material that cannot be delivered
  → better CO2 footprint

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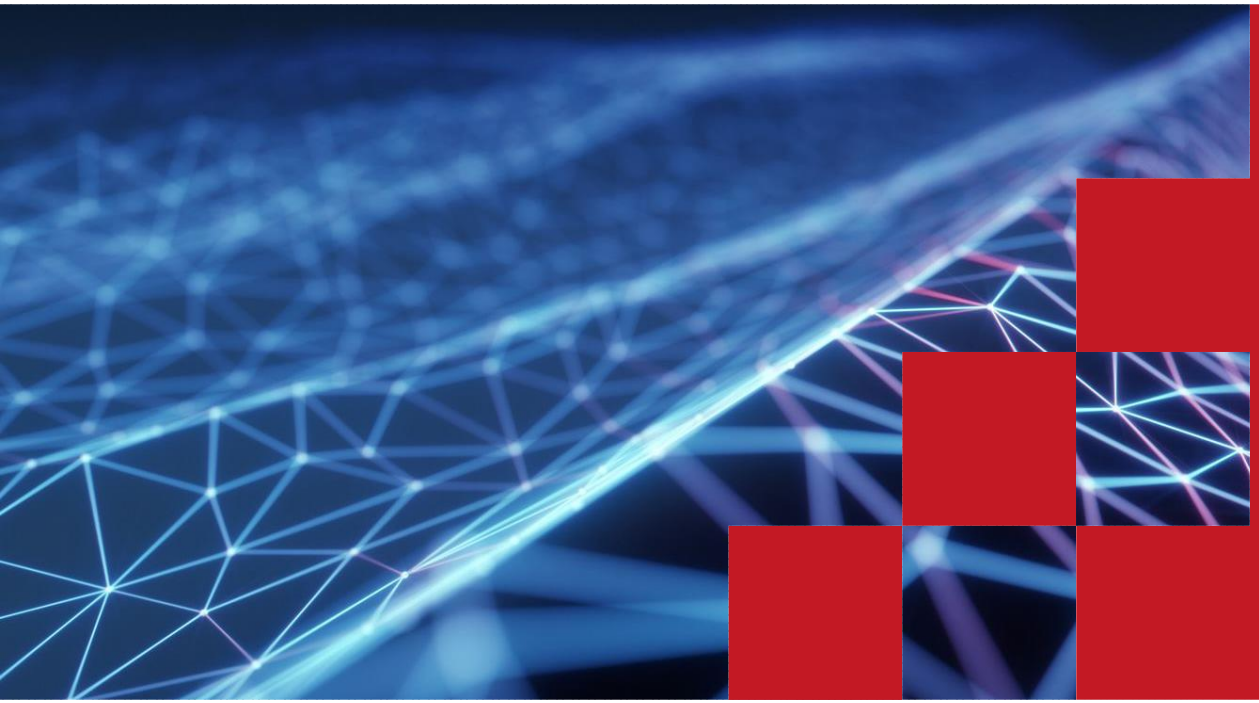
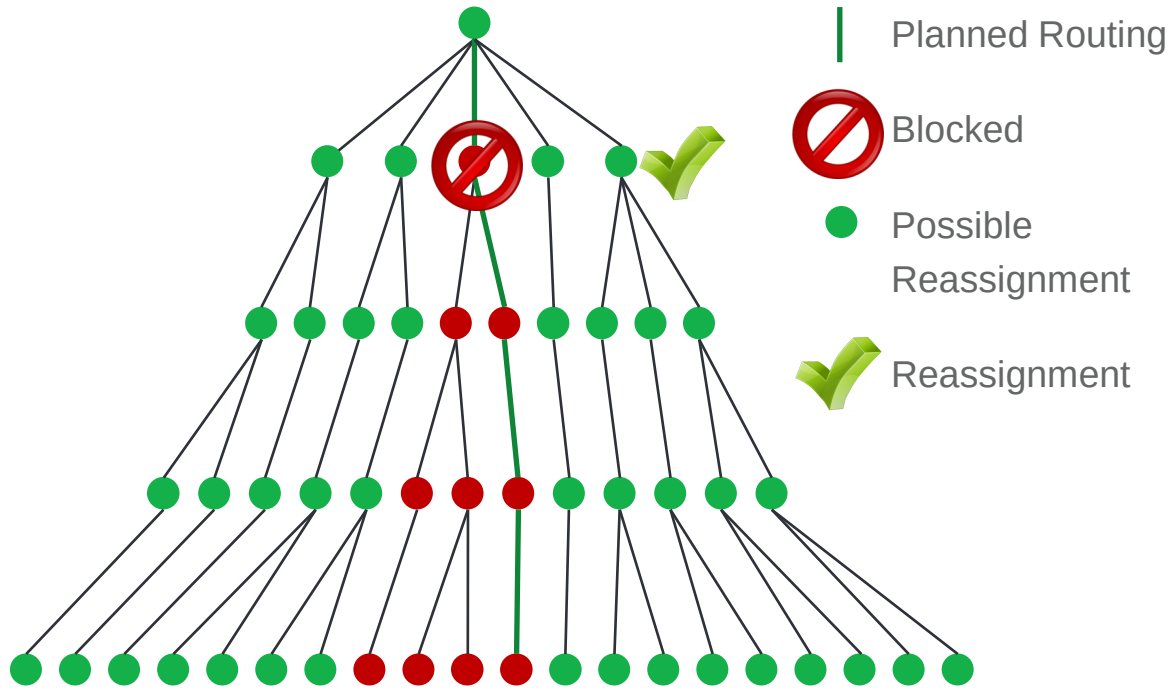


Return on Investment

Performance Potential

Return on Invest Principles

- **Block as early as possible**
  Each production steps add value that will be lost on scrapping the material
- **Reassign/Downgrade as early as possible**
  Each production step reduces the flexibility finding an alternative order / usage



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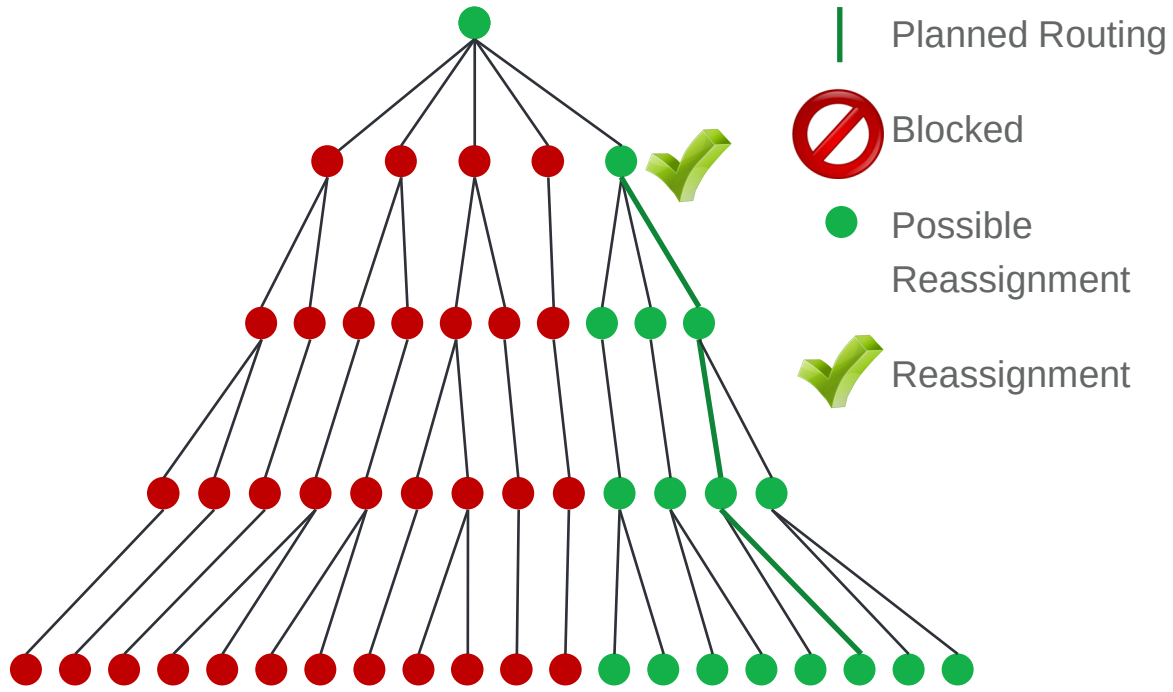

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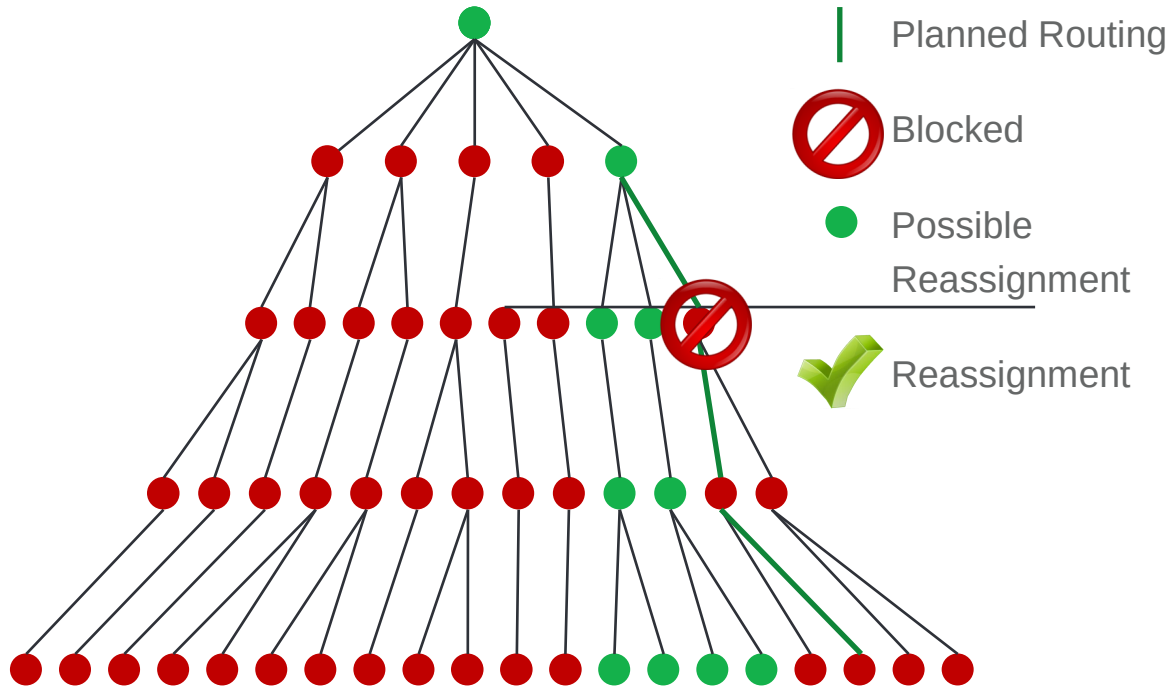

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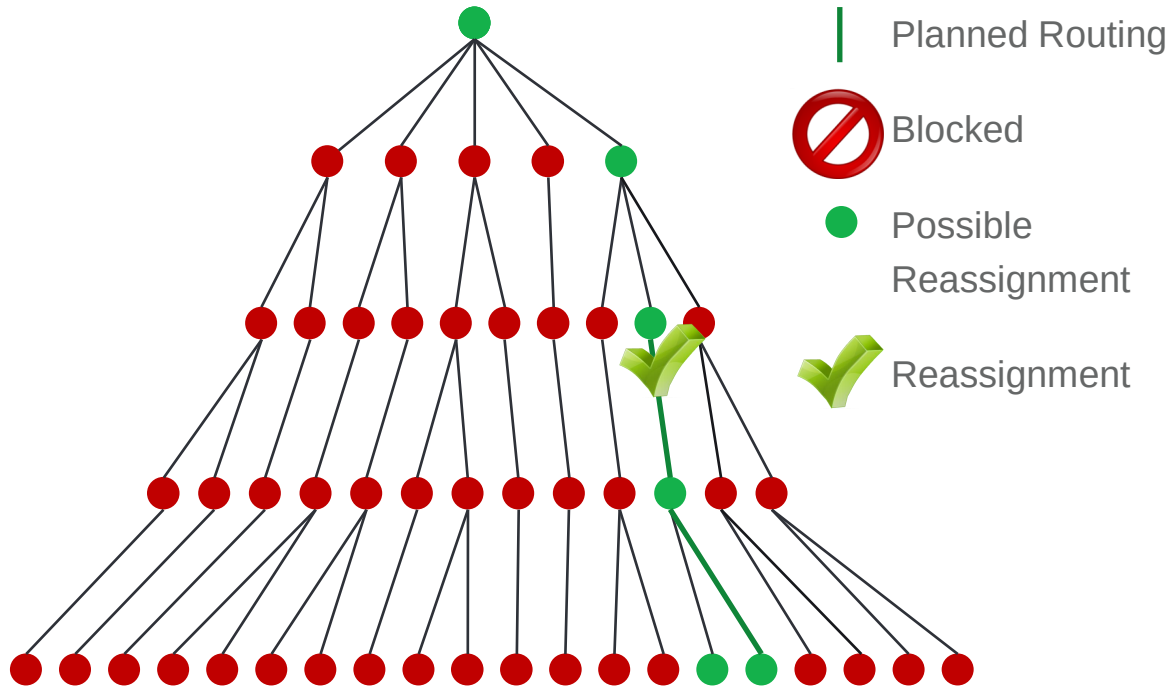

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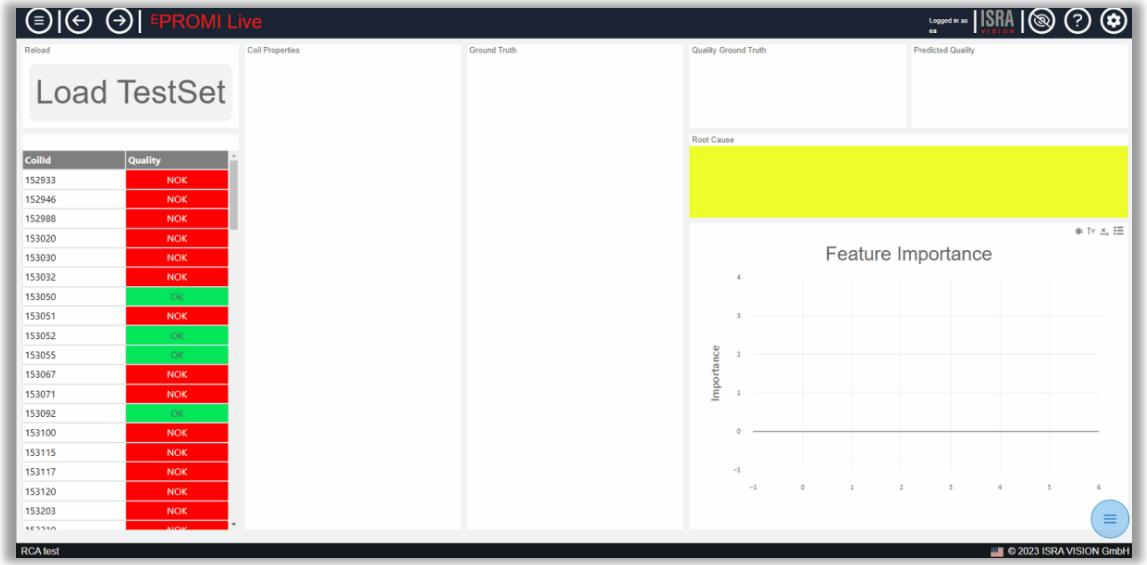
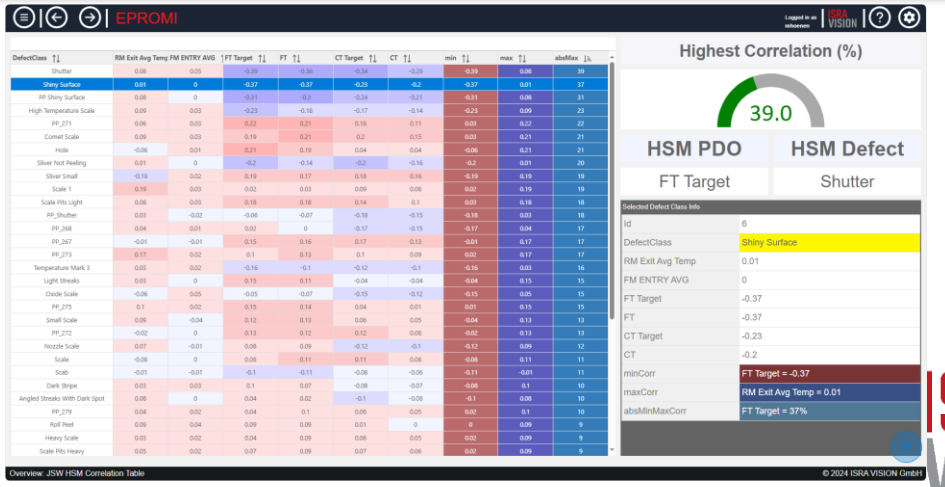
  to define the most important influencing factors leading to minor quality





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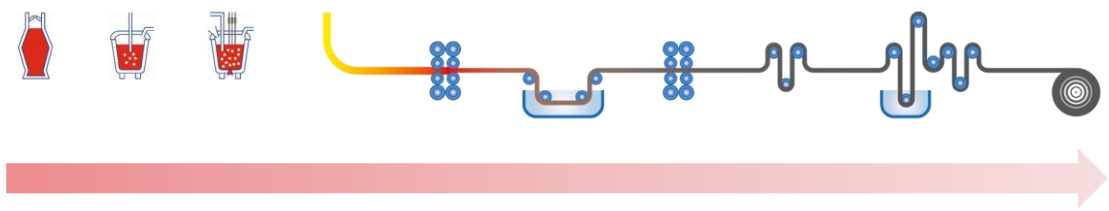

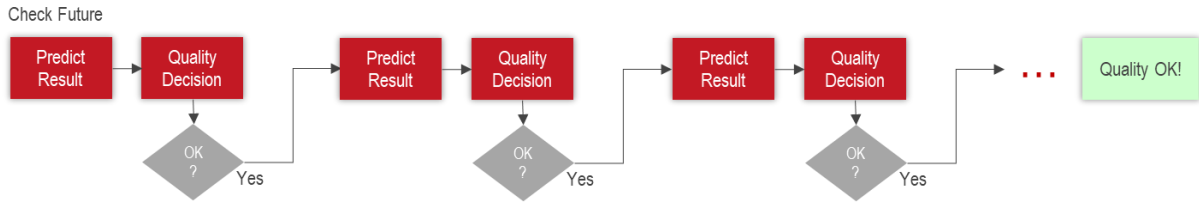

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- **Predict Quality**
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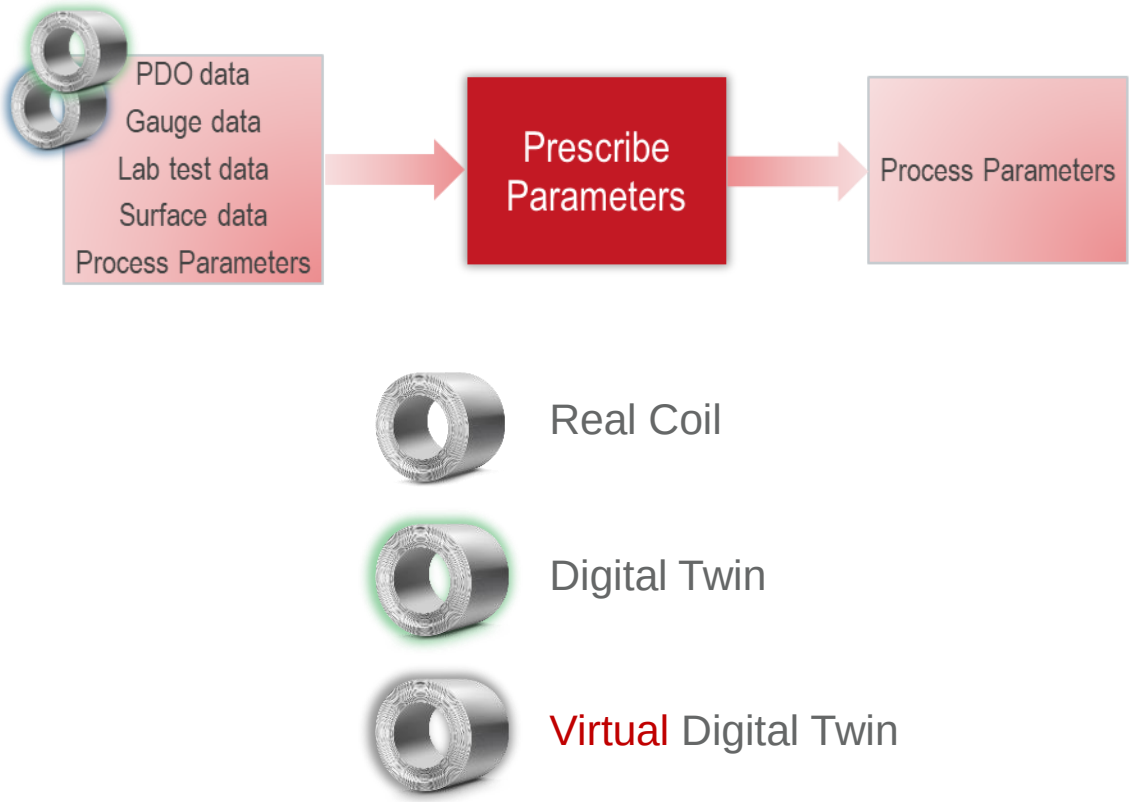
- **Prescribe optimal process parameters**
  to increase first hit rate and yield



Return on Invest

Assumptions

- Overall Production
  - 28 Mio. tons Steel
  - 23 Mio. tons Hot Rolled Coils
  - 18 Mio. tons Down Stream
- Values
  - Slab: 400$ per ton
  - Hot Rolled Coils: 580$ per ton
  - Down Stream: 720$ per ton
- Downgrade loss:
  - Slab: 10%
  - Hot Rolled Coils: 20%
  - Down Stream: 20%

- Deviation rate: 3%
- Rework rate: 3%
- Rework loss: 3% (conservative estimation)
- Deviation Reduction 40%
- Rework Reduction 50%

- Customer claims will lead to highest loss:
  (EBITDA) ~80%
  Delivered and claimed amount is not estimated here

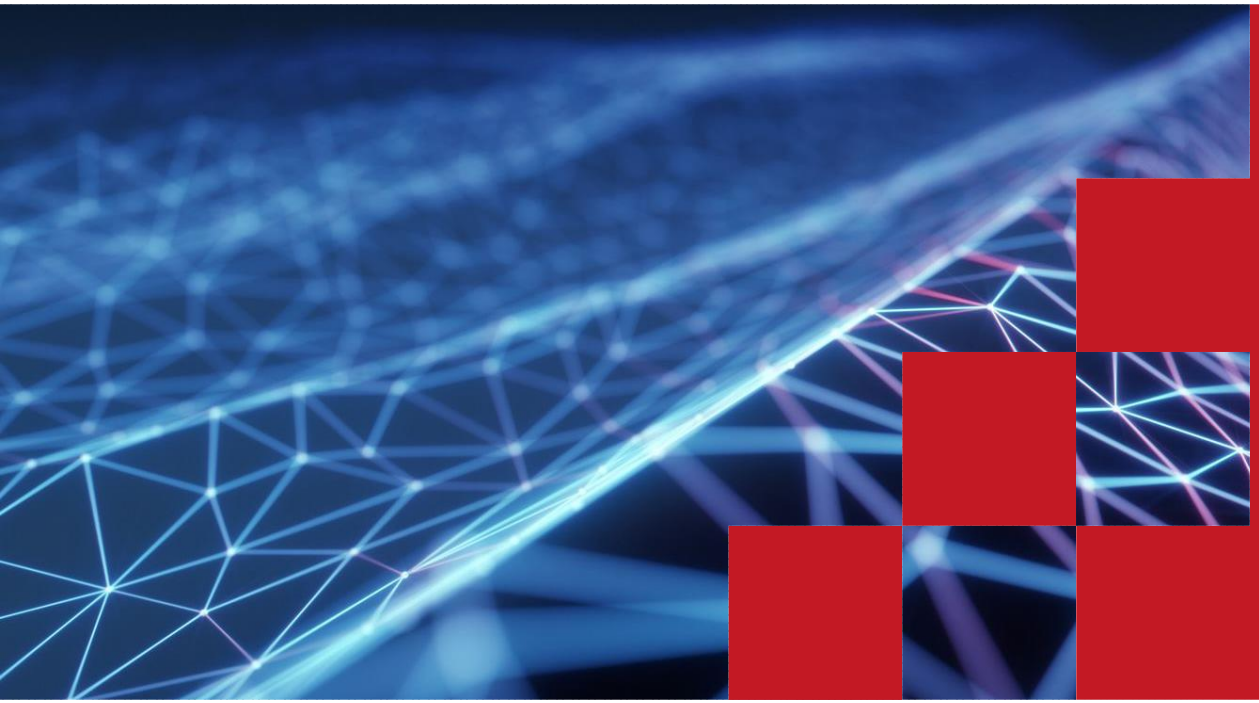
Return on Invest

Overall Savings

Cost savings with PqD	Saving
Steel Making*)	**Steel Making**
13,4 Mio $ + 2,1 Mio $ + 2,5 Mio $	18 Mio $
Hot Rolling*)	**Hot Rolling**
32,0 Mio $ + 3,45 Mio $ + 3,1 Mio $	38,55 Mio $
Down Stream*)	**Down Stream**
31,1 Mio $ + 3,25 Mio $ + 3,25 Mio $	37,6 Mio $
	~ 94 Mio $

Potential ROI with **conservative value estimation** and downgrade ranges at the lower end of our experience

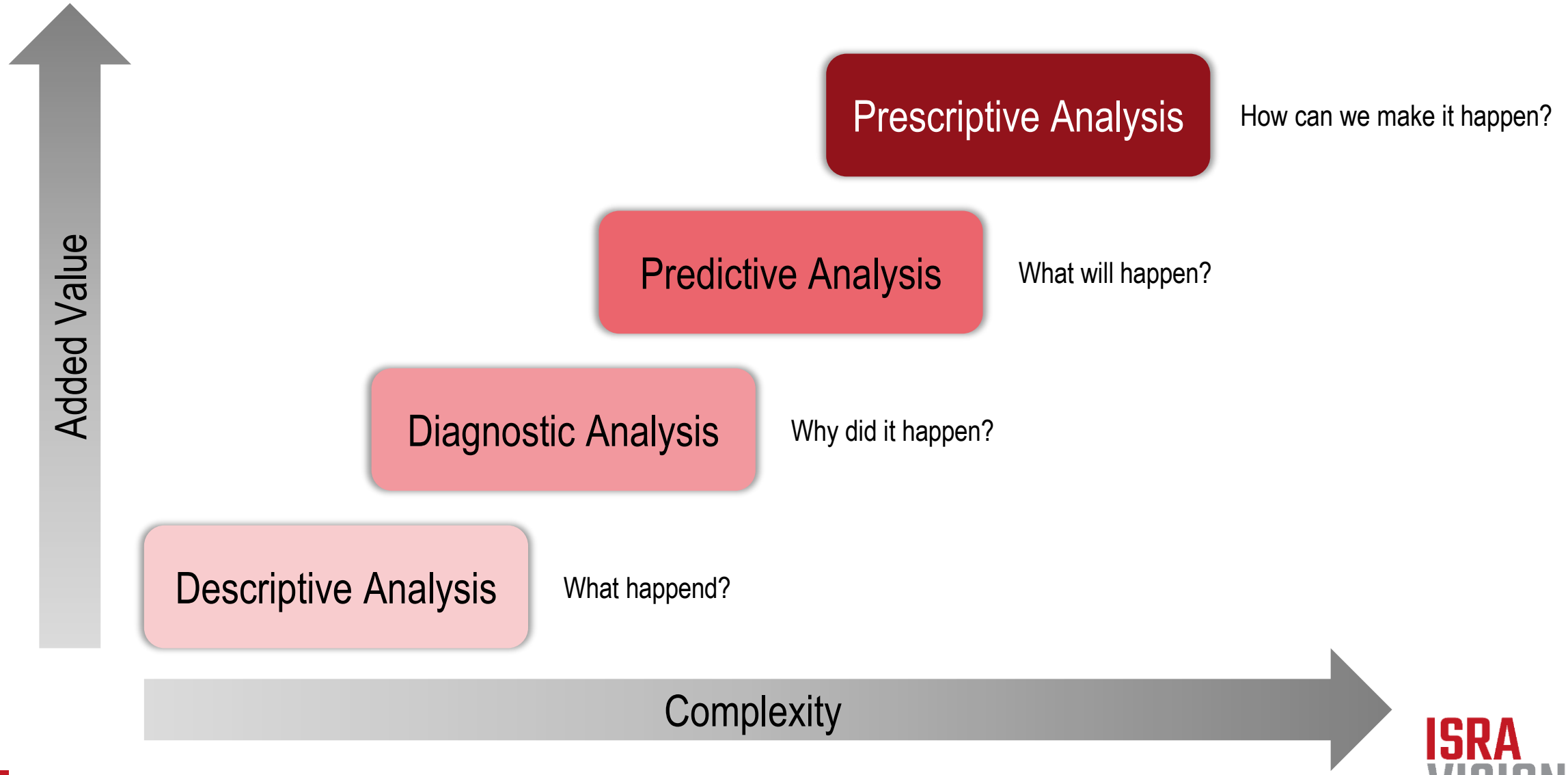
*)down grade = 50% (1,8%), rework and scrap 3%



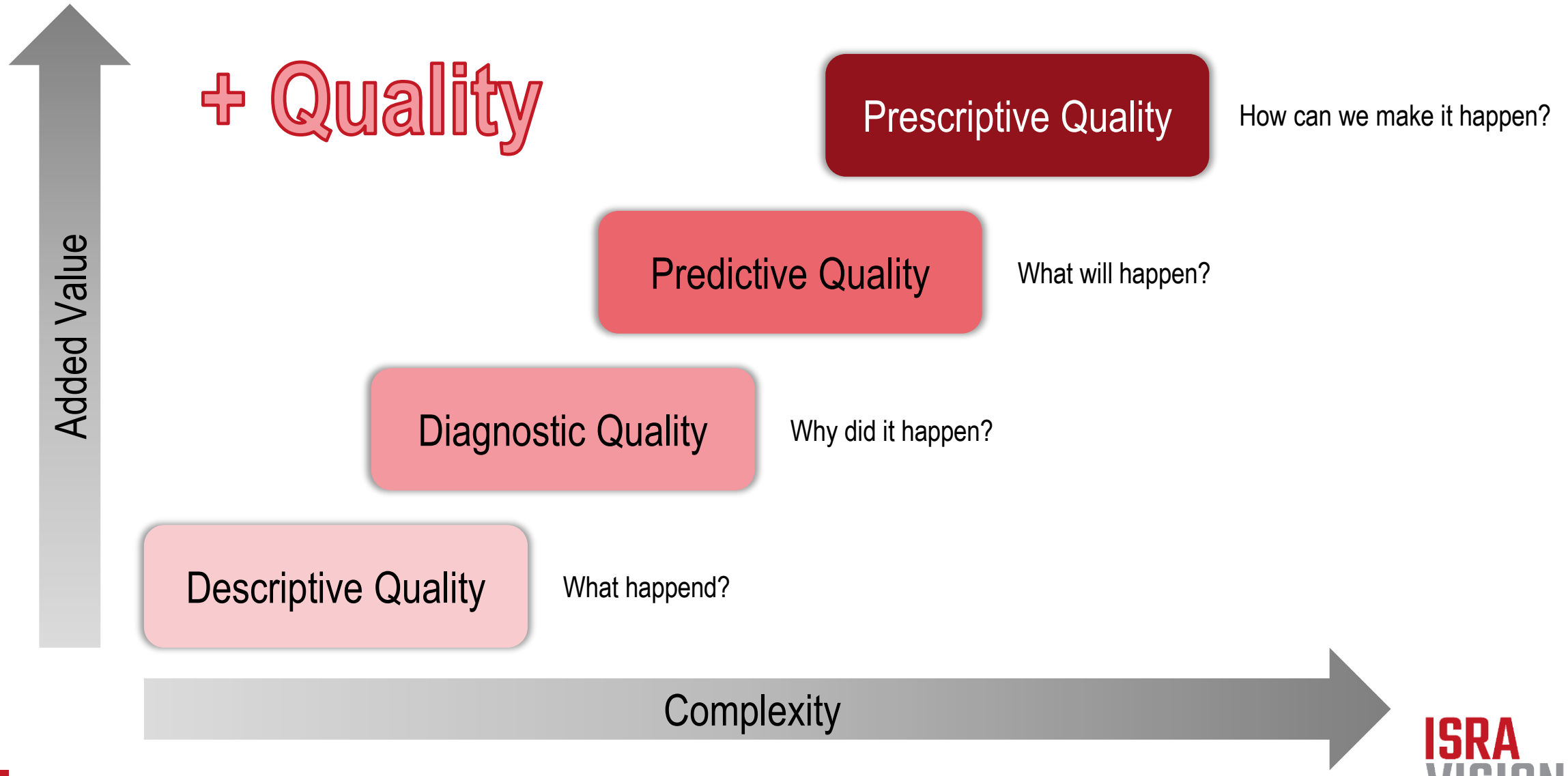
Technology

Proven Standard Applications and new Technology

Types of Data Analytics

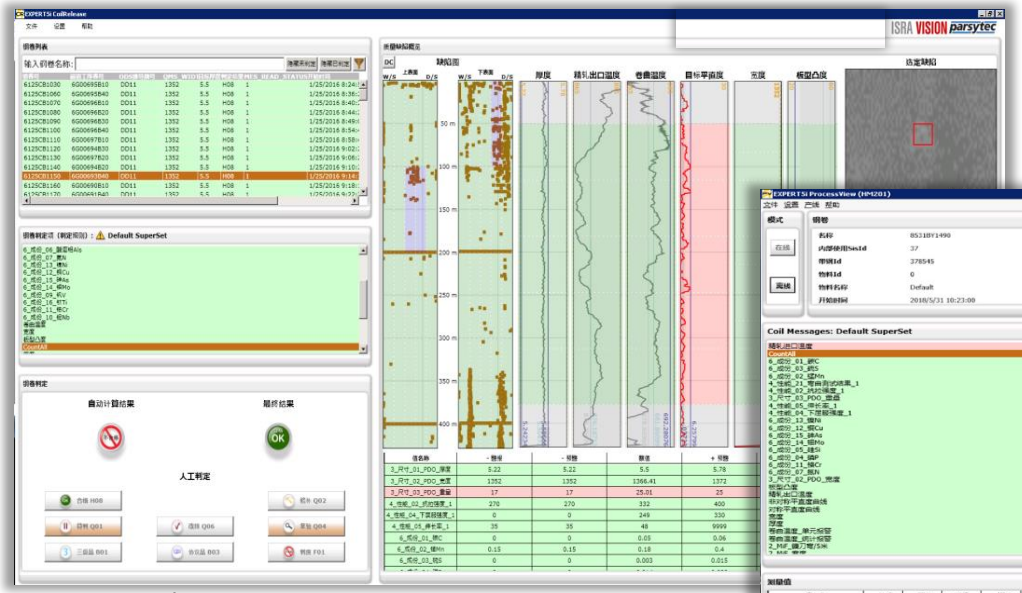


Types of Quality Analytics

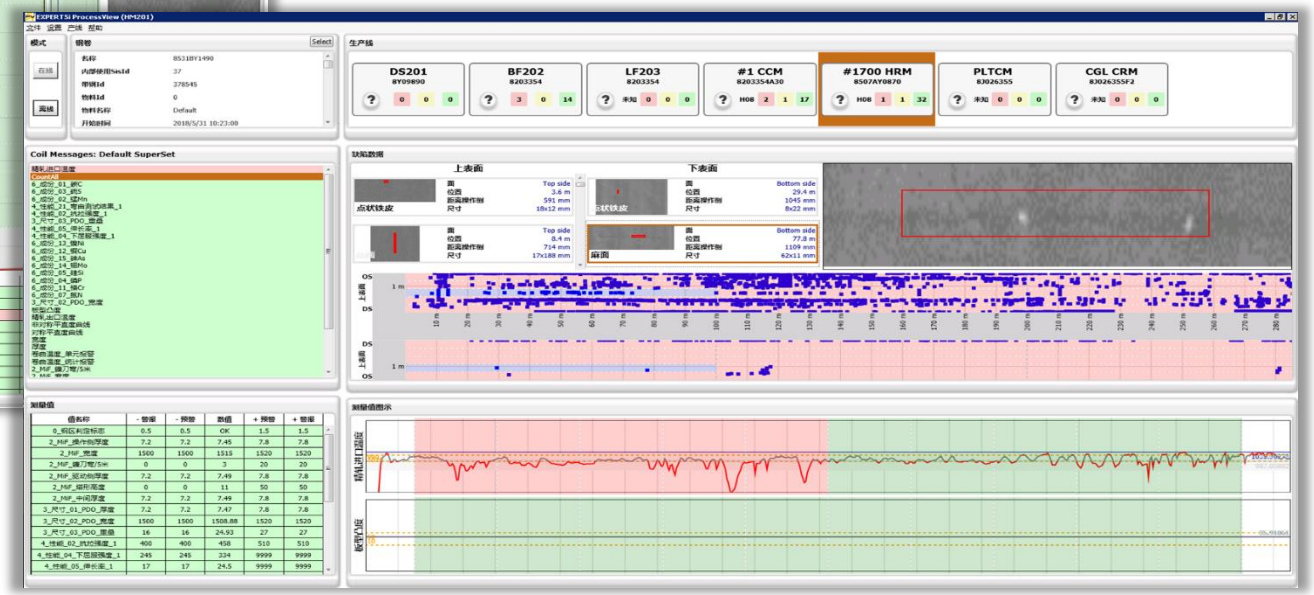


Types of Quality Analytics – Data Visualization

Added Value



EXPERT5i CoilRelease



Monitoring & Alarming - ProcessView

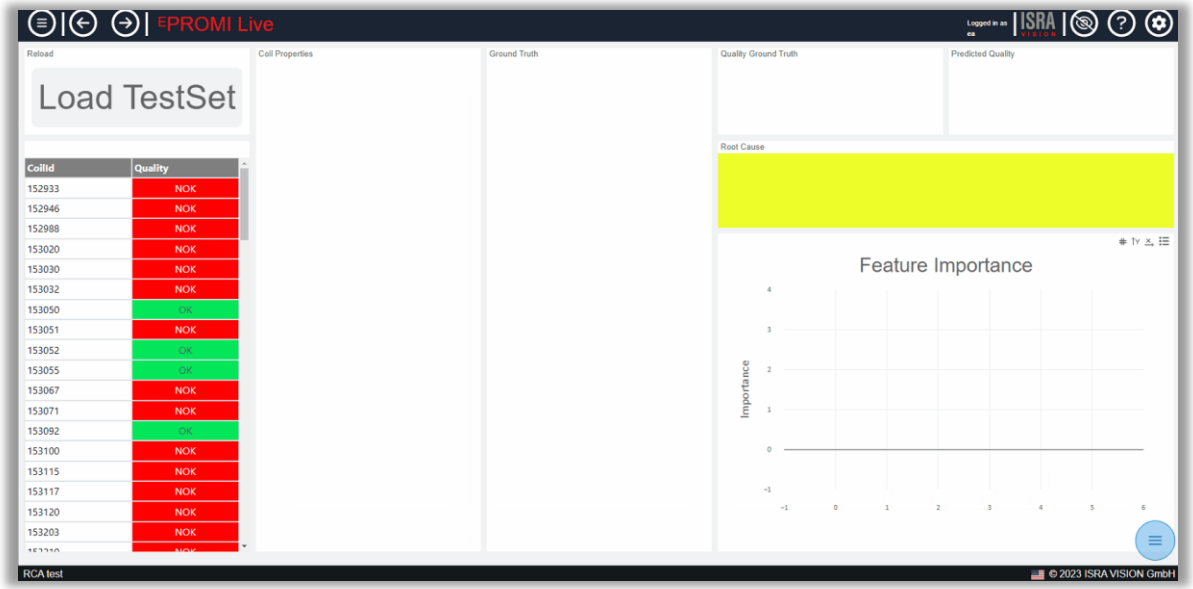
Descriptive Quality

What happend?

Complexity

Types of Quality Analytics – Model based Data Correlation

Added Value



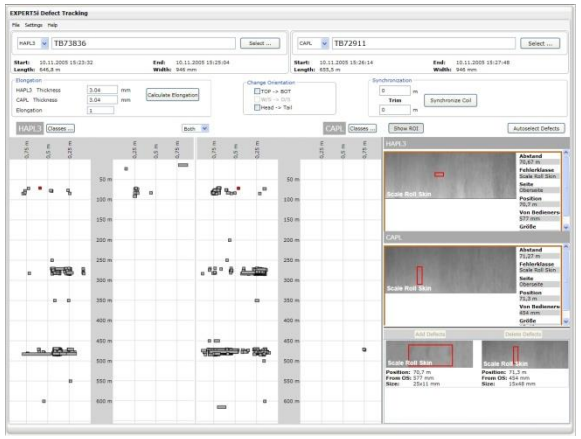
Diagnostic Quality

Why did it happen?

Complexity

Types of Quality Analytics – Visual Defect Development Analysis

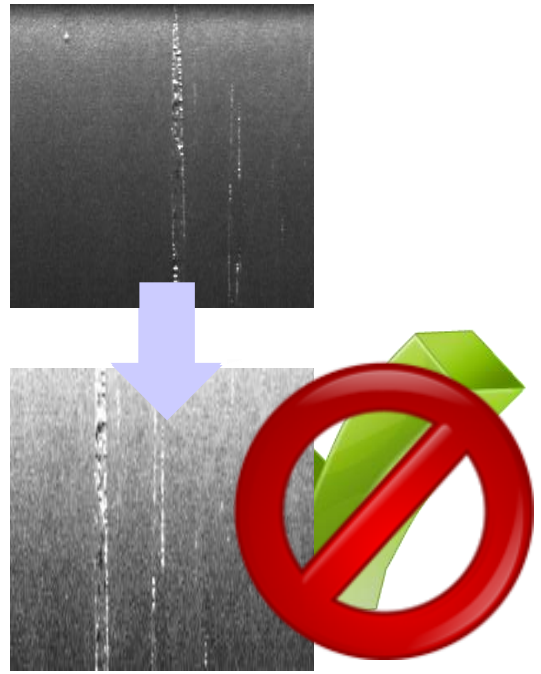
Added Value



EXPERT^{5i} DefectTracking

Predictive Quality

What will happen?



Complexity

Types of Quality Analytics – Prescription using explicit model

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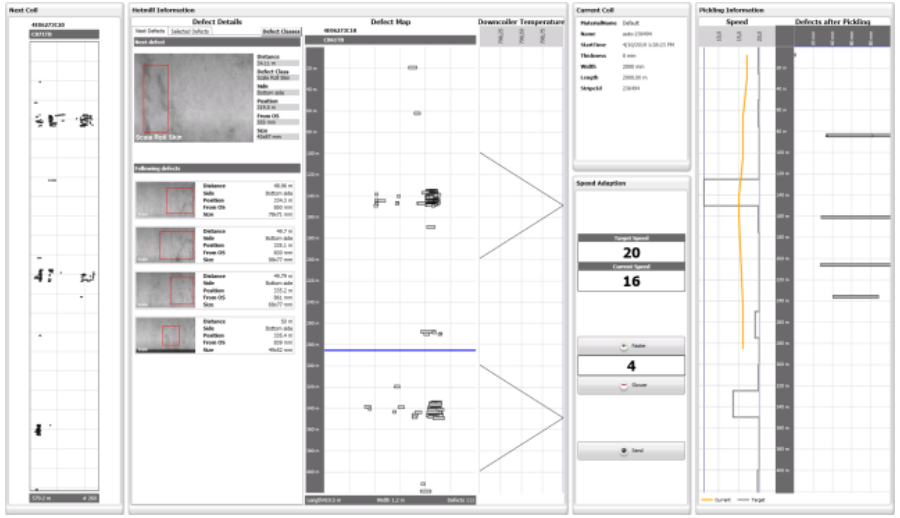
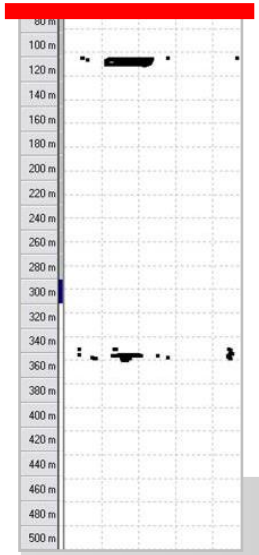
Added Value

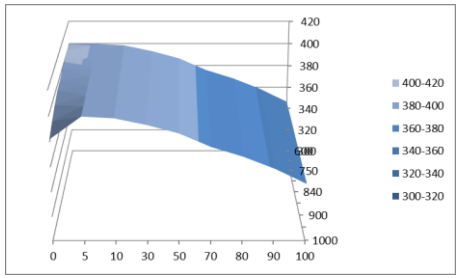


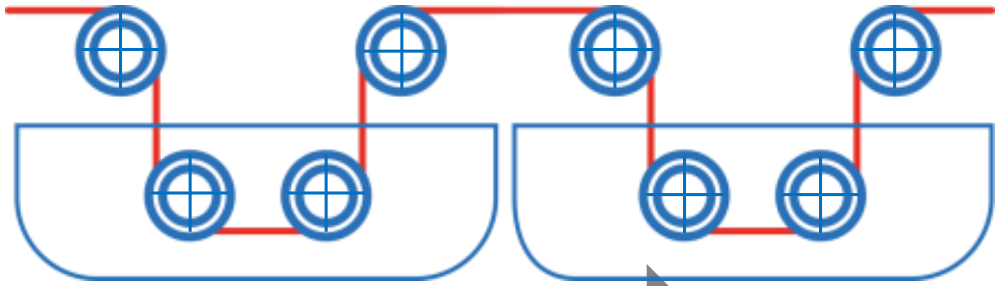
EXPERT5i PickleProcessTuning



Prescriptive Quality

How can we make it happen?





Complexity

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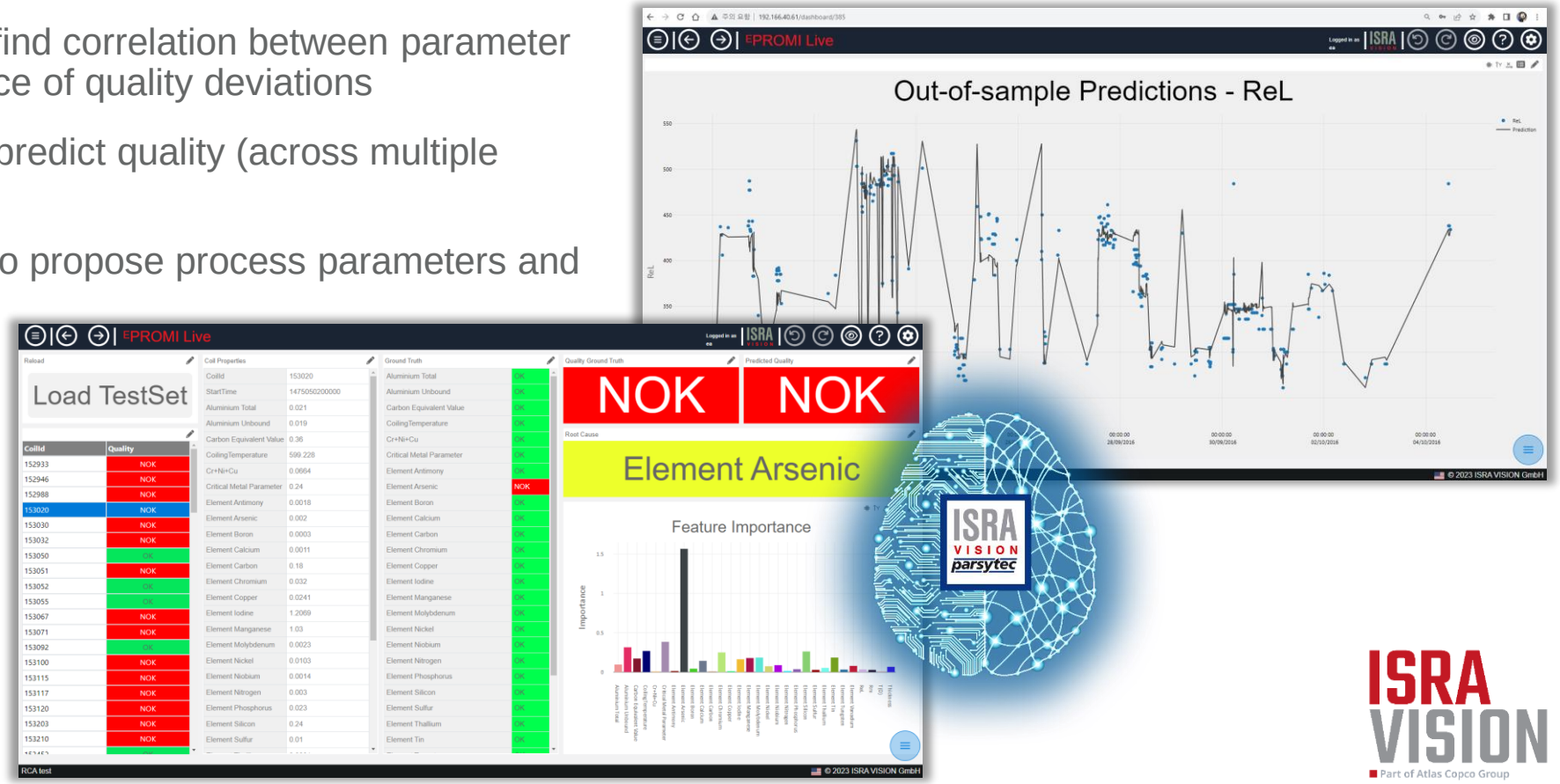
Performance & Quality Management

At the Glance

The „Big Data“ approach

- Use **diagnostic analytics** technology to find parameter (combinations) and blocked coils/slabs
- Use **diagnosic analytics** to find correlation between parameter (combinations) and occurrence of quality deviations
- Use **predictive analytics** to predict quality (across multiple production steps)
- Use **prescriptive analytics** to propose process parameters and routing



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Thank You

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