Prozessanalytik und Prozessoptimierung

Integrierte Prozessoptimierung am Beispiel von Misch- und Trennprozessen unter Nutzung spektroskopischer Methoden zur schnellen quantitativen bzw. qualitativen on-line Analyse

Company profile

ruped systems


IGZ Barleben

- President: Dr. Frank Rutzen
- Founded in 2003 as management Buy-Out
- Based near Berlin, Germany
- solid R&D department
- Award-winning technological innovations in vision technologies
- Efficient network of sector-leading specialists for polymer research, recycling and refining solutions

Product Profile

ruped systems

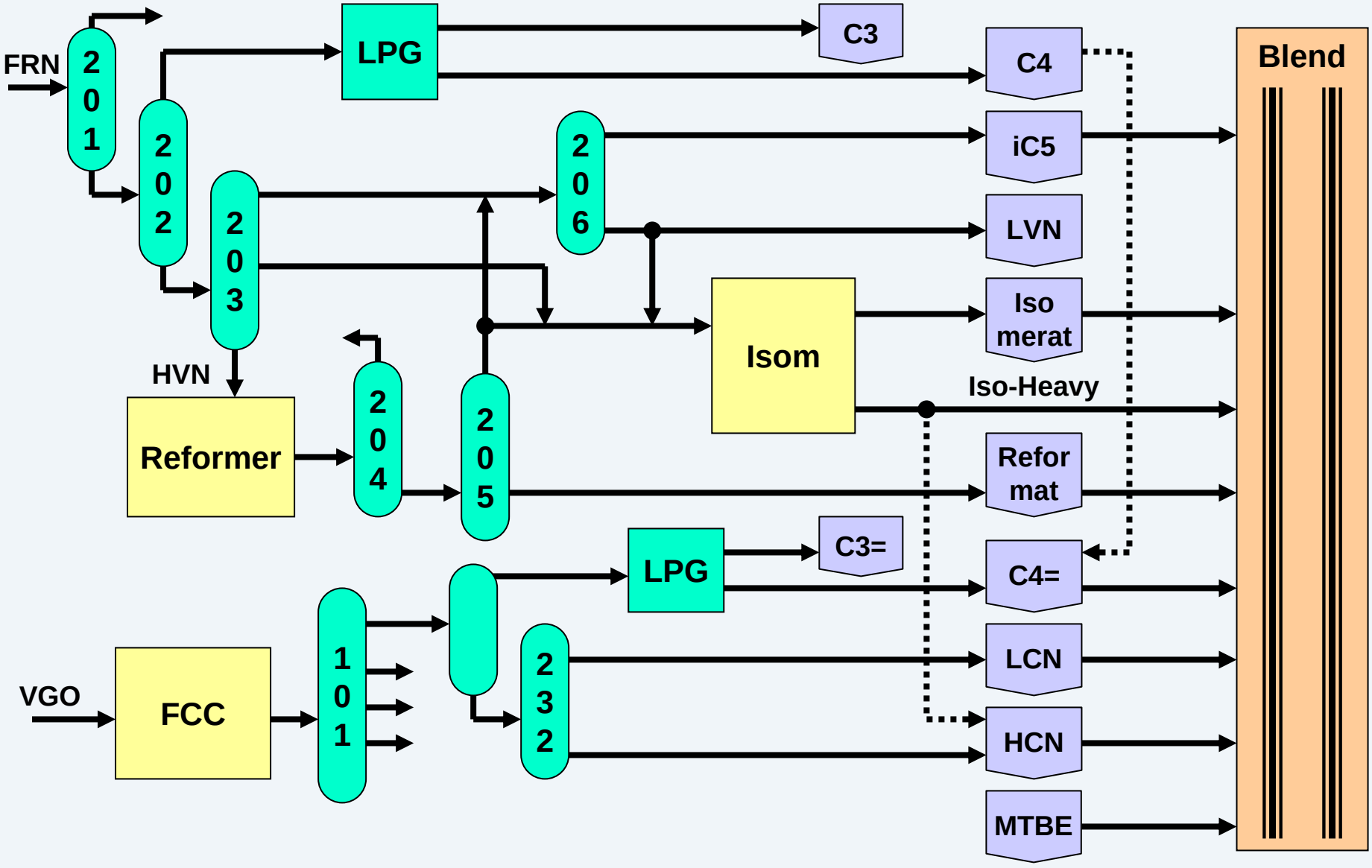
- product lines

Vision Technology for
analysing and recognising
of discret parts, bulk materials
and solid surfaces

Software Technologies for
process optimising in Reycling
and Petrochemical processing

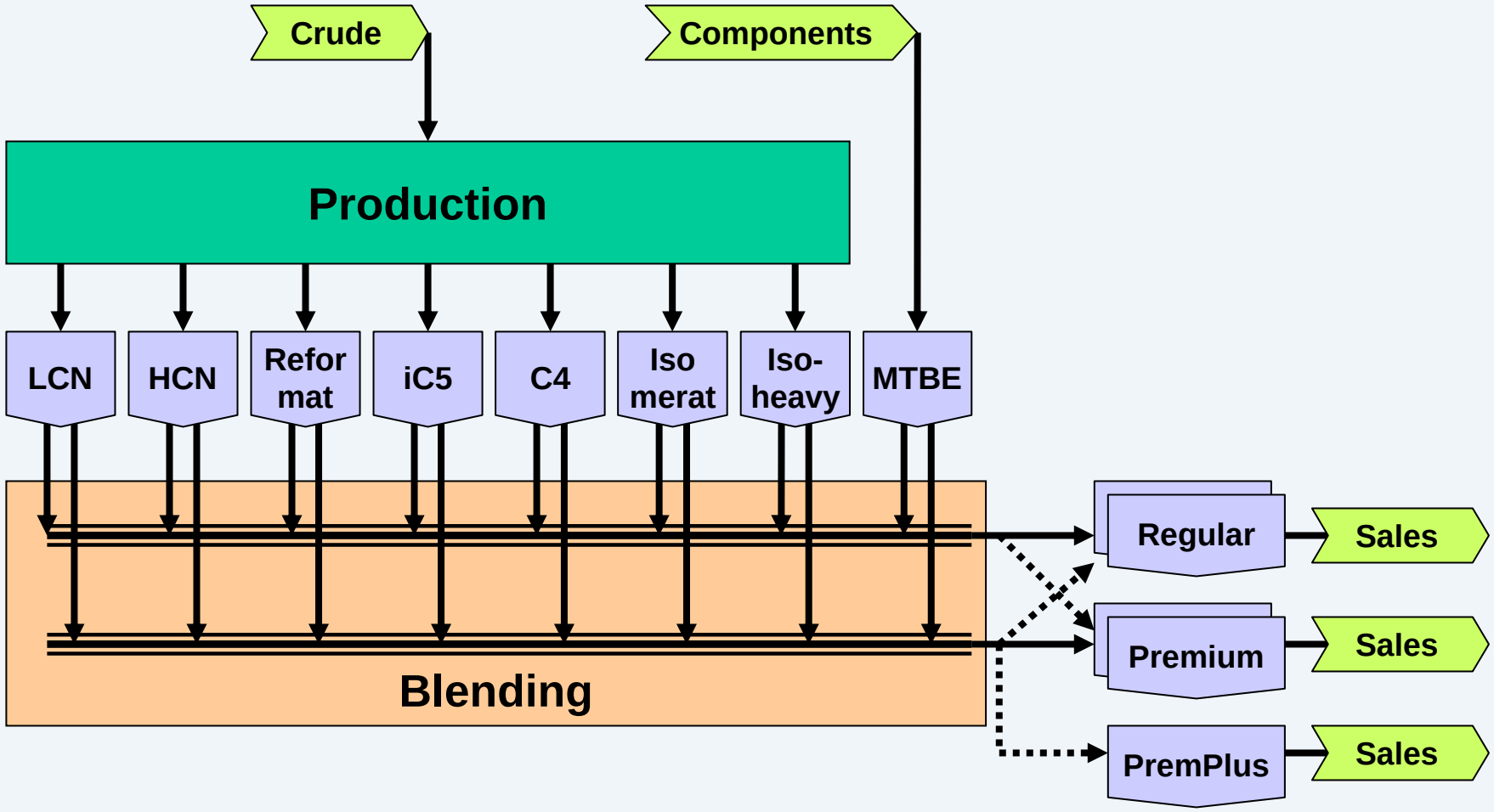
Blending Configuration

ruped systems



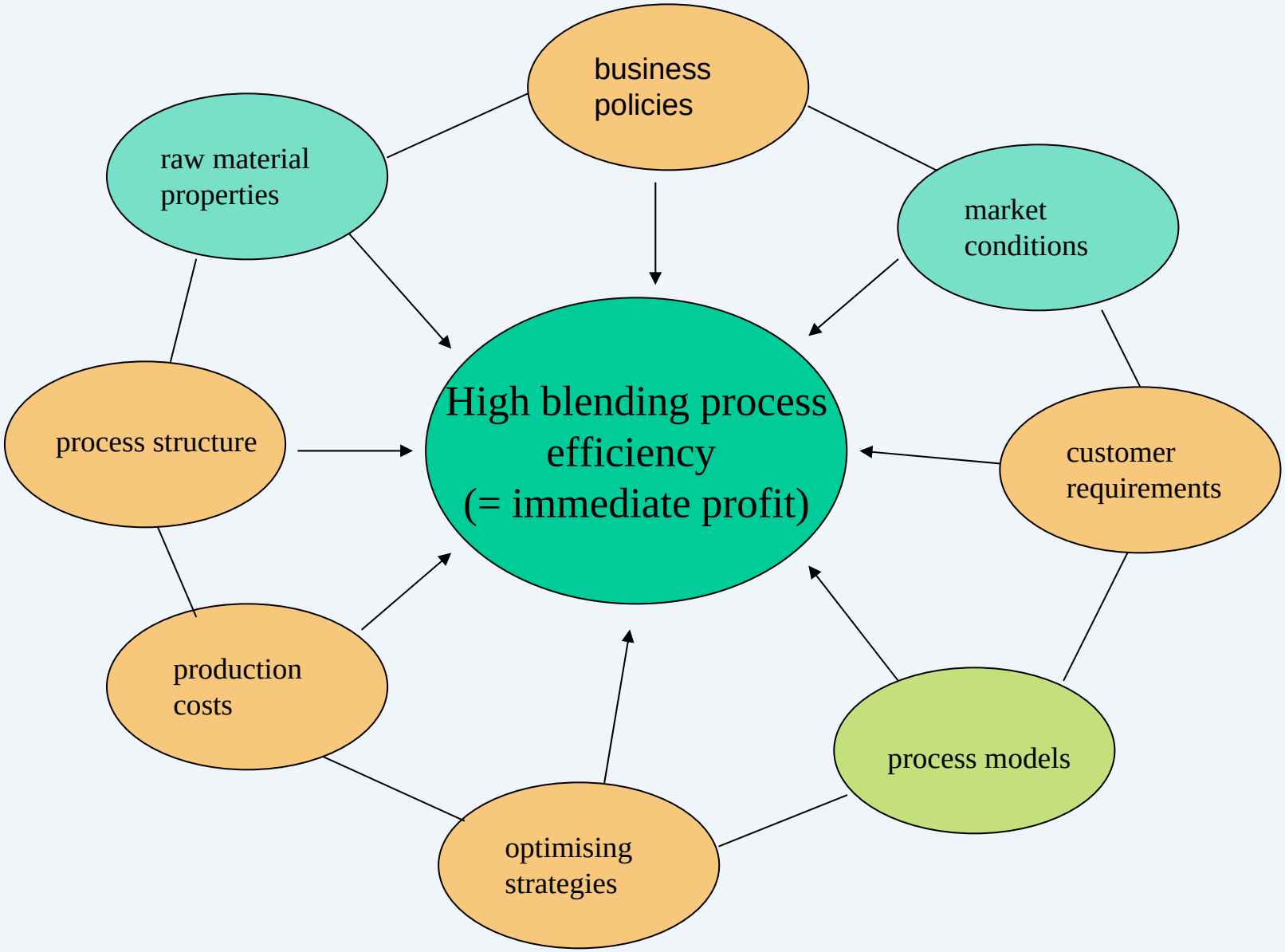
Blending Configuration

ruped systems



Magnitude of Influence

ruped systems



ped blending™

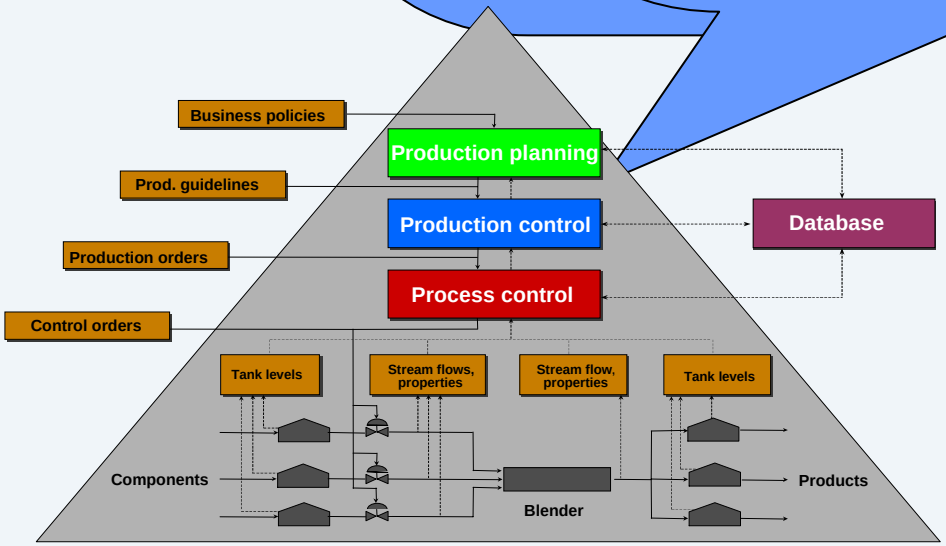
ruped systems

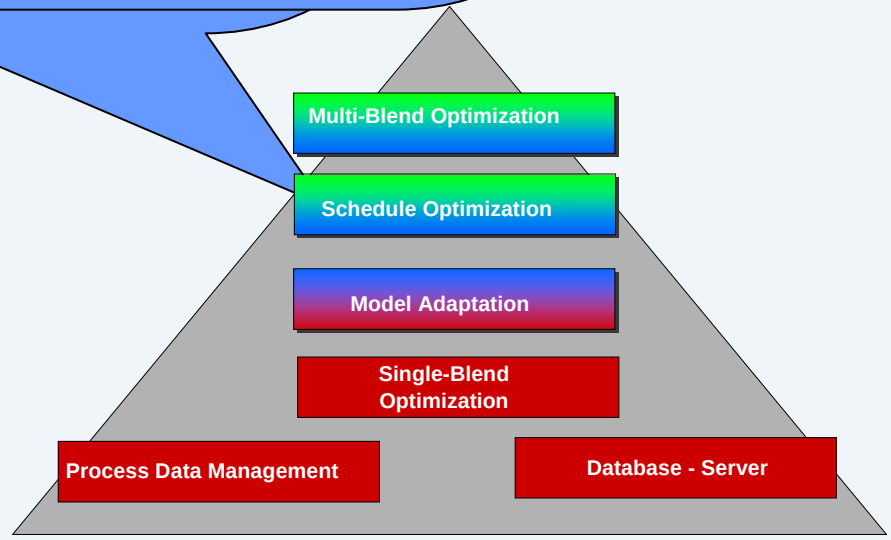
Key fe
contro

- ✓ **Hierar**
  plant c
- ✓ **Optimi**
- ✓ **Integra**
  mode
- ✓ **Extens**
- ✓ **Modul**
- ✓ **INTER**

Hierarchy model for planning and scheduling

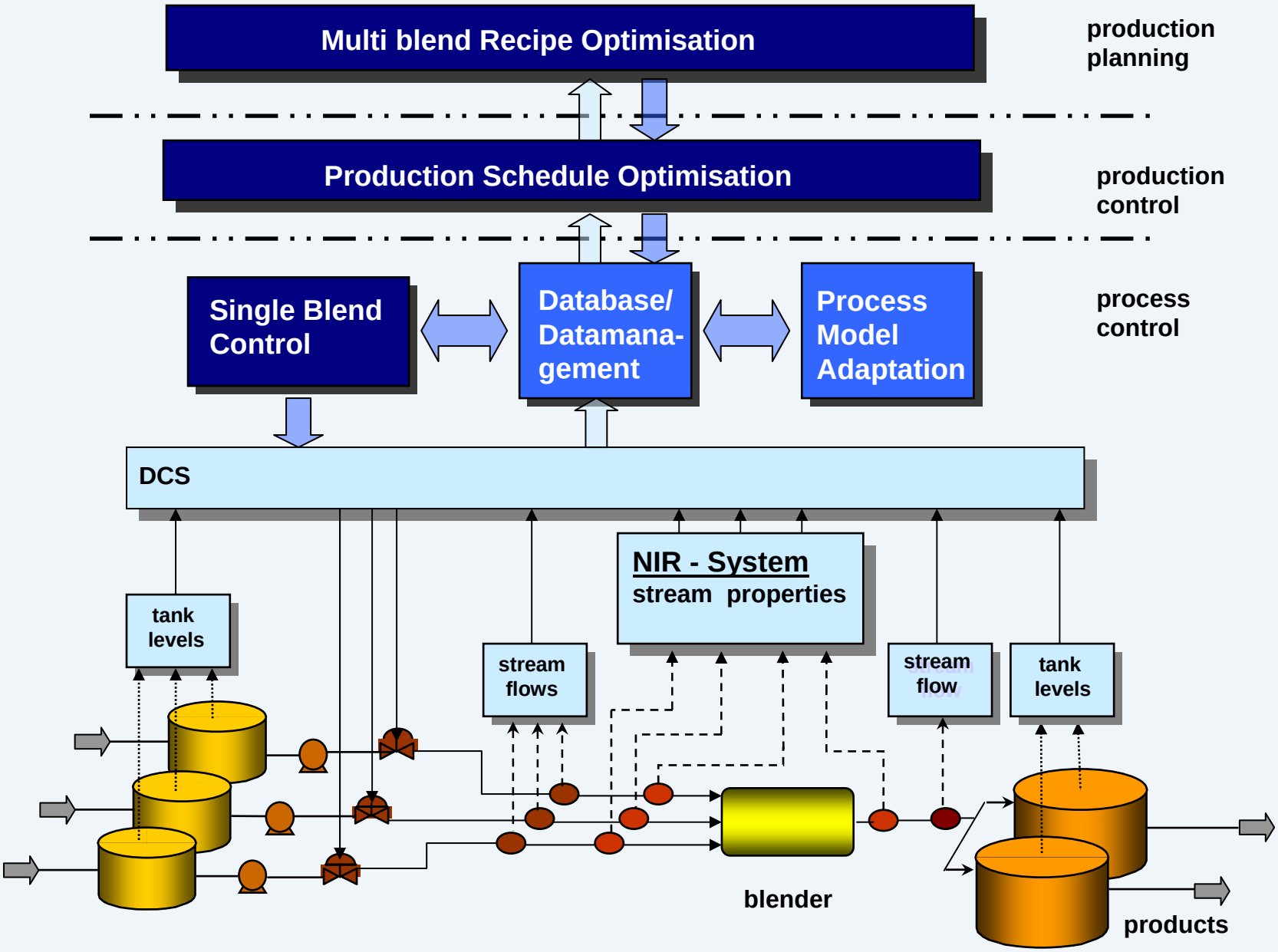
- Differentiation is made between production planning and production control and process control
- The depth of detail and the reliability of information used increase from top to bottom
- The time horizon in question is longest on the planning level and diminishes rapidly in progression towards that of process control
- The partial tasks are resolved at every level
- The result of one level serve as initial data of the subsequent level
- A feedback loop leads from each of the lower levels to the one above





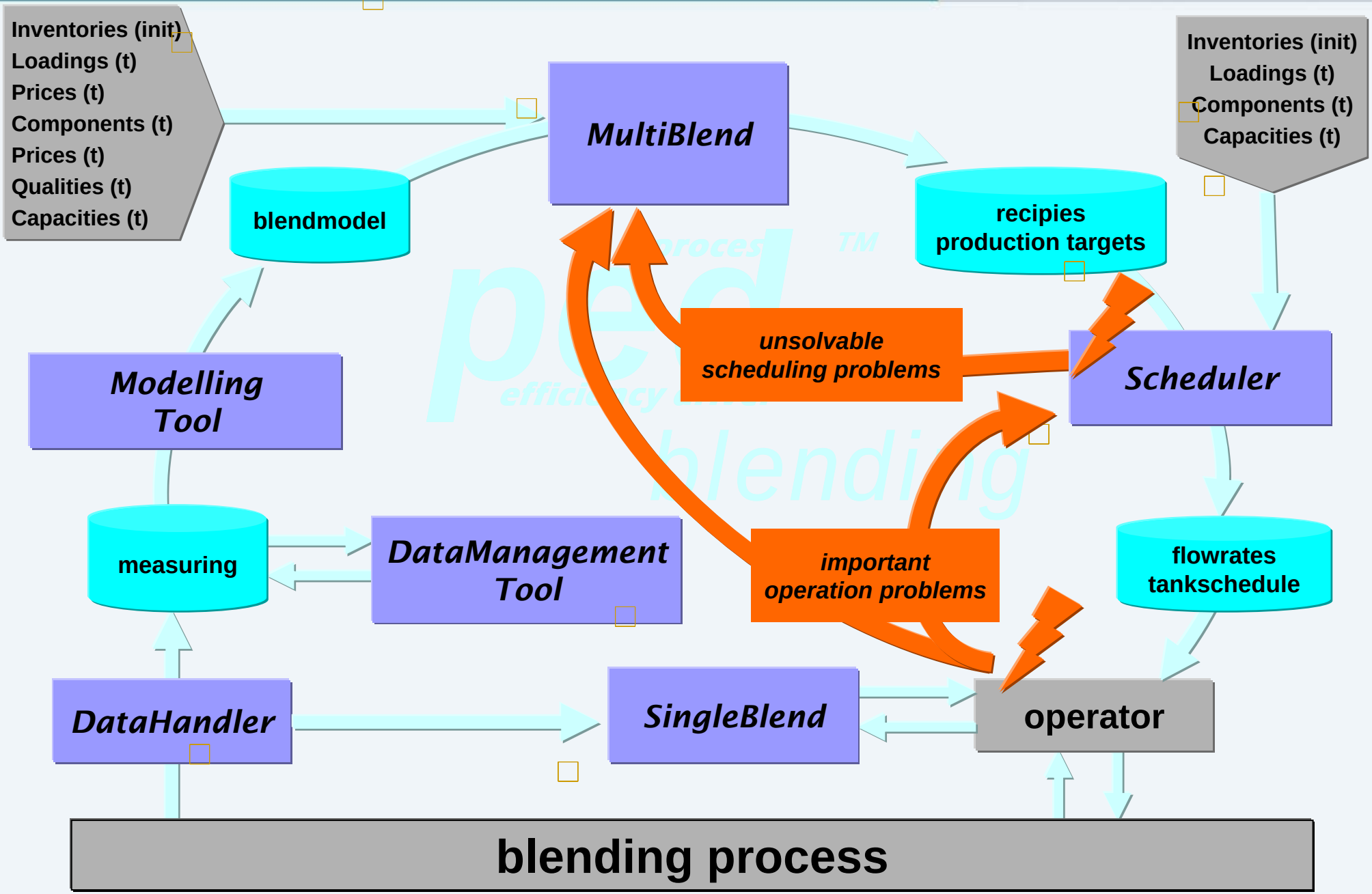
Integrated Planning and Optimising

ruped systems



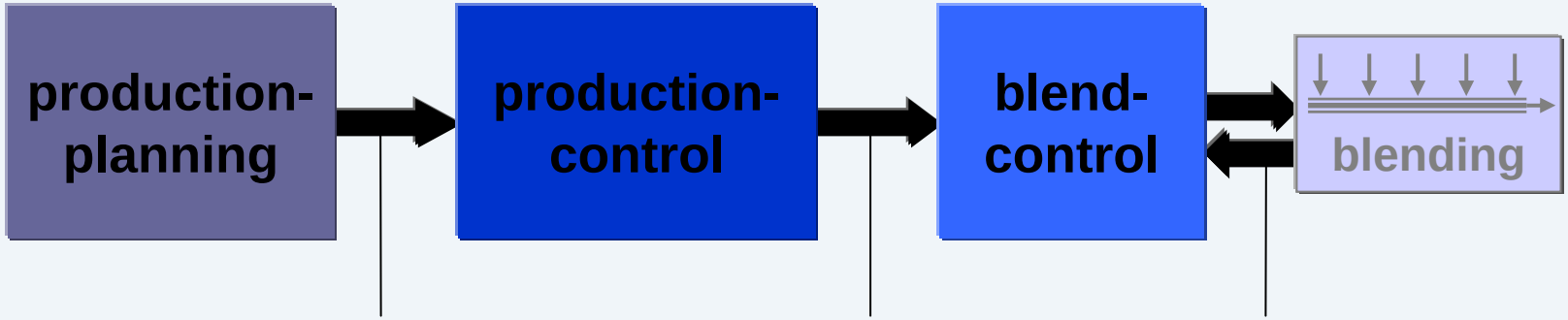
planning circle

ruped systems



Optimisation of Blending

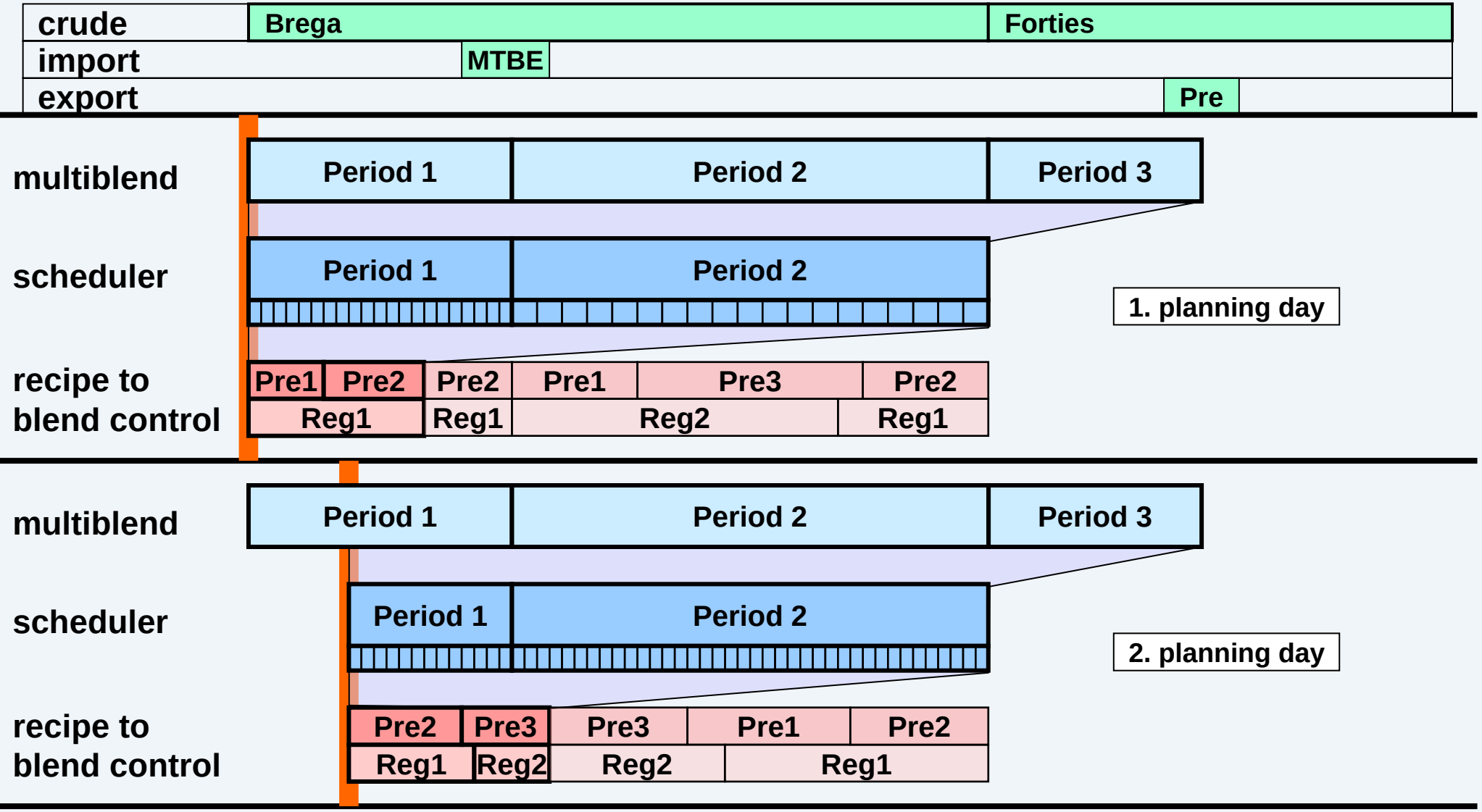
ruped systems



information flow		*optimal recipe & quantity scenario overall*	*recipe schedule for each blending*	*settings & measurement*
optimisation target	maximise profit	minimise deviation to planning scenario	minimise deviation to recipe
time span	actual till 2 - 4 weeks ahead	actual till 1 week ahead	actual blend control

Planning on a rolling basis

ruped systems



Installation Requirements M&A

ruped systems

- Installation of on-line analysers to measure

  - MON, RON, RVP, density, E70, E100, E125 and benzene (Gasoline)
  - density, cloud point, flash point, CFPP, cetane index and sulphur (Gas oil)
  - density, viscosity, Flash Point, Pour Point, Cloud Point, GC (Lube oil)

on all relevant component and product streams !

- NIR- analysing technologies are recommended

- On-line measurement of tank levels, component and product stream flows - (DCS - interfaces are available)

Advantages of applying **rapid optical methods** for process control (NIR for example)

ruped systems

NIR spectroscopy can be applied to a large number of product parameter of hydrocarbons and other fluid materials

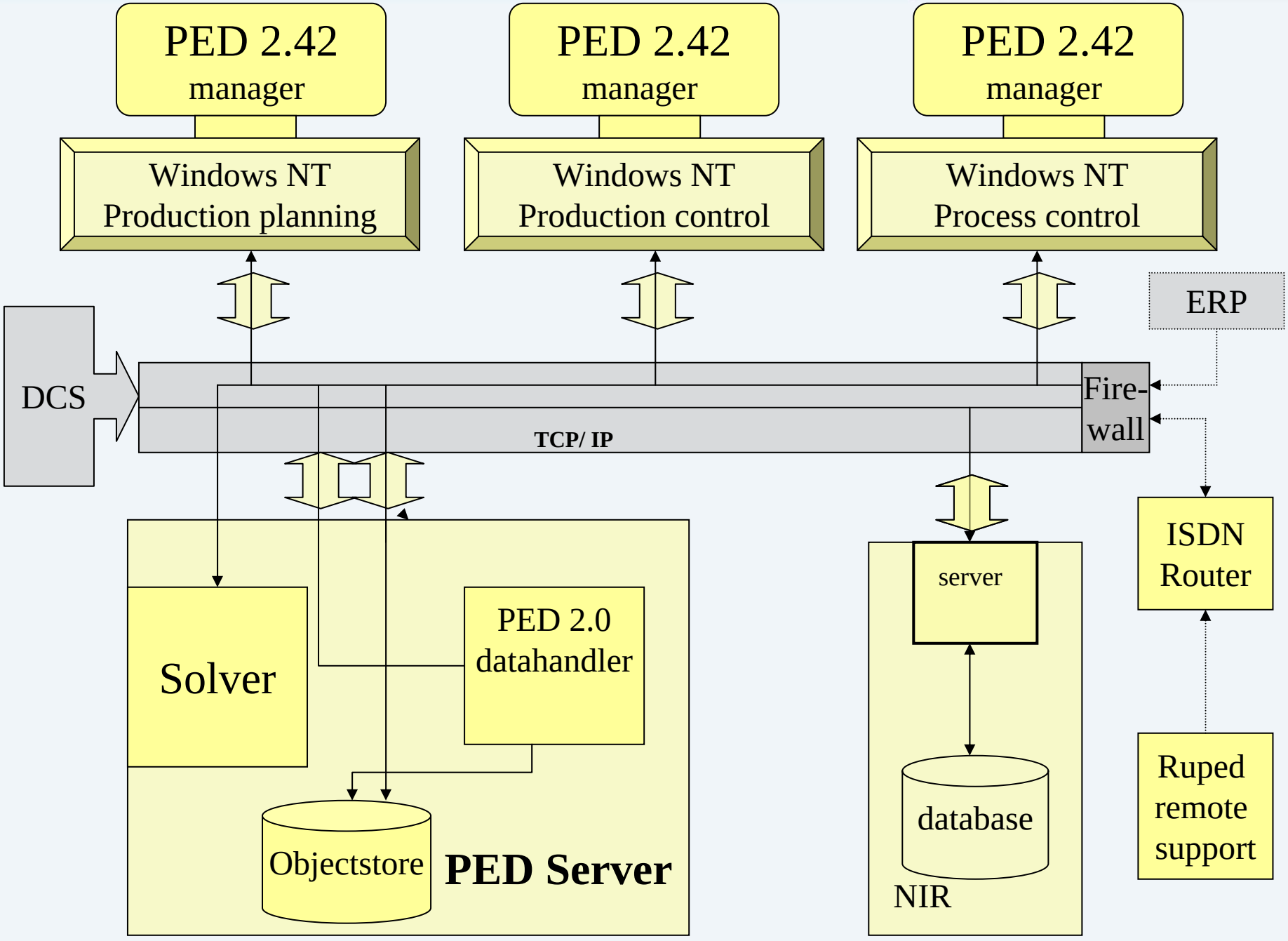
Huge cost advantages can be achieved by simultaneously measuring several parameters (e.g. 5 streams, 6 parameter each)

Short measuring cycle, depending on the spectroscopic principle leads to:

- Enabling a fast evaluation of average values in real-time to minimise the occurrence of normally distributed errors
- An improved identification of the process states due to high data density
- fast reaction of the measuring system with parameter jumps; no delay caused by the measuring method because of transient effects

Lower maintenance activity results with regards to the hardware

IT-structure



Production planning benefits

ruped systems

Decrease costs

- Maximise the use of low-cost components
- Minimise the use of additives and external components
- Minimise the use of high-cost components
- Calculate optimal ratios for different products
- Decrease stock

Increase planning efficiency

- Spend less time on forecasting and planning
- Avoid formal planning errors
- Perform “what-if?” studies

Production control benefits

ruped systems

Decrease costs

Minimise the use of high-cost recipes
Optimise the use of process equipment
Decrease stock

Increase planning efficiency and flexibility

Spend less time and manpower on planning
Increase certainty in planning
Create optimal schedules automatically
Increase flexibility towards changing demands

Process control benefits

ruped systems

Decrease costs

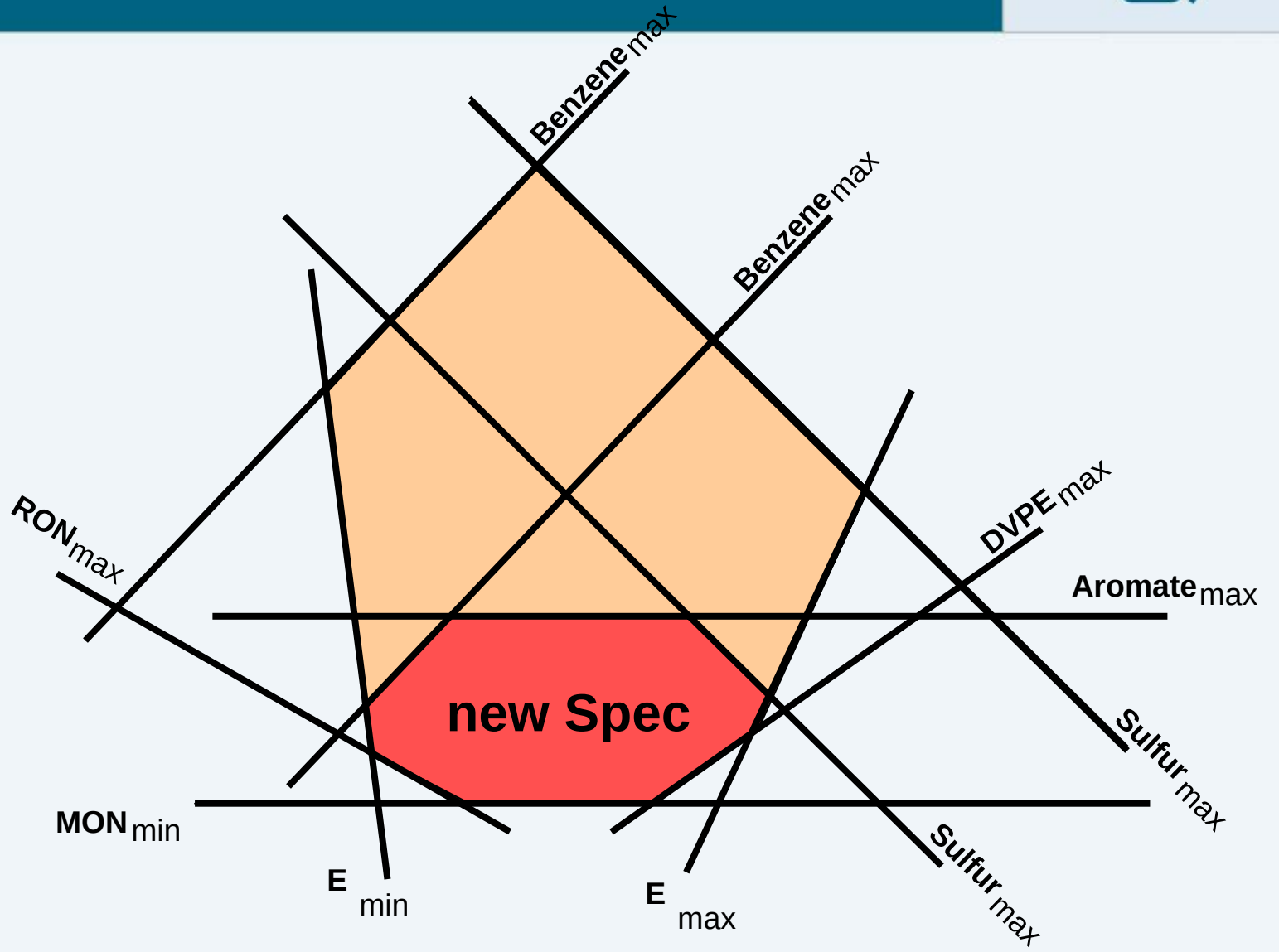
- Minimize product quality give-away
- Blend without any over-specification
- Avoid reblends
- Reduce laboratory effort

Improve process control

- Apply exact and adapted blending models
- Reduce response time
- Minimize or eliminate operator errors

Potential Benefits: ex. 2 – gas oil blending

ruped systems



Potential Benefits: ex. 1 gasoline

ruped systems

Total gasoline production per anno :			**1.020 kt**
DVPE:	**+1,2 kPa**	**= 0,288 $/t**	**293.760 $/anno**
MON-Reg:	**- 0,17 MON**	**= 1,003 $/t**	**409.224 $/anno (40%)**
MON-Pre:	**- 0,12 MON**	**= 0,708 $/t**	**433.296 $/anno (60%)**
Sum			**1.136.280 $/anno**

Potential Benefits: ex. 1 gasoline

ruped systems

Profit increasing in a gasoline application

- Reduce specification give-away:
  - Motor octane number by 0.10 MON
  - Research octane number by 0.15 MON
  - Vapour pressure by 1.5 [kPa]
- Optimization of blending recipes to reduce component costs
- Reduction of component and product stock inventory

Reported benefits range up to 0.25 $ per barrel of product

Production of 3 Mio tons gasoline and gas oil per annum:

⇨ **Increased profit up to 6 Mio $ per annum**

Produktionsoptimierung bei der Kunststofftrennung

ruped systems

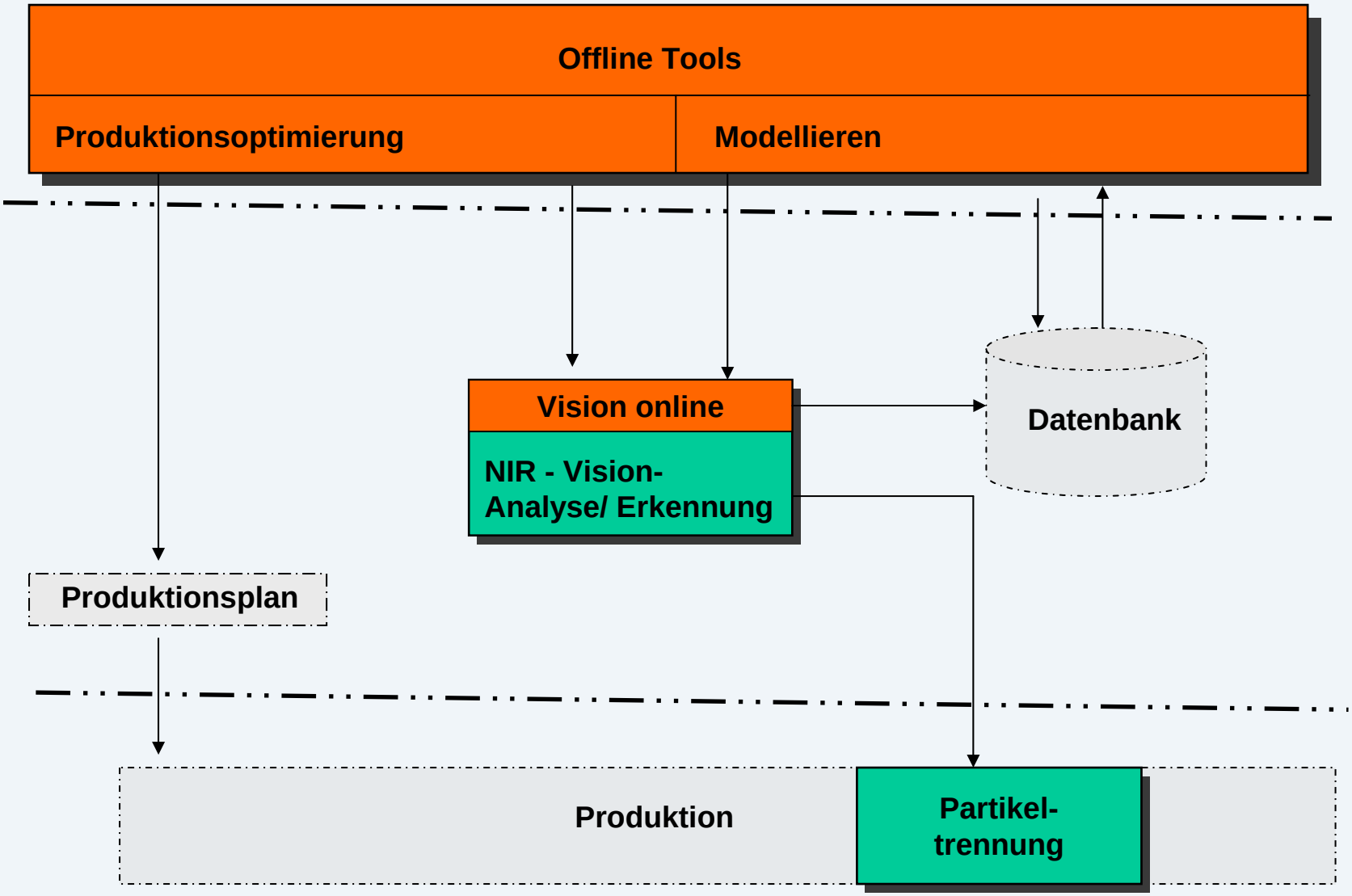
Produktionsoptimierung bei der Kunststofftrennung

ruped systems

PET sorting technology + PET refinement technology + PET finishing

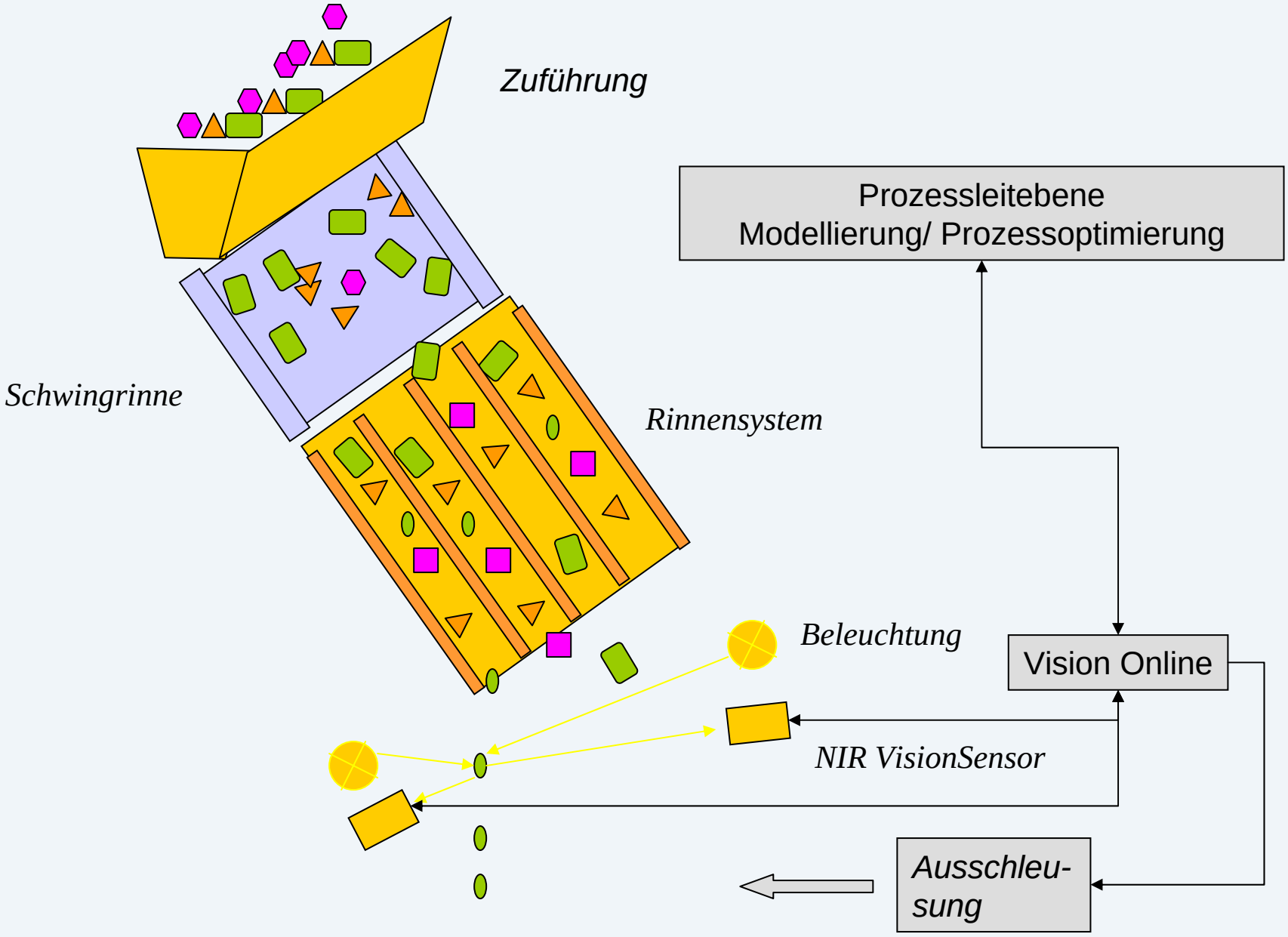
Produktionsoptimierung bei der Kunststofftrennung

ruped systems



Produktionsoptimierung bei der Kunststofftrennung

ruped systems



Produktionsoptimierung: Beispiel Kunststofftrennung

ruped systems

Reflexionsmessung fester Kunststoffbestandteile

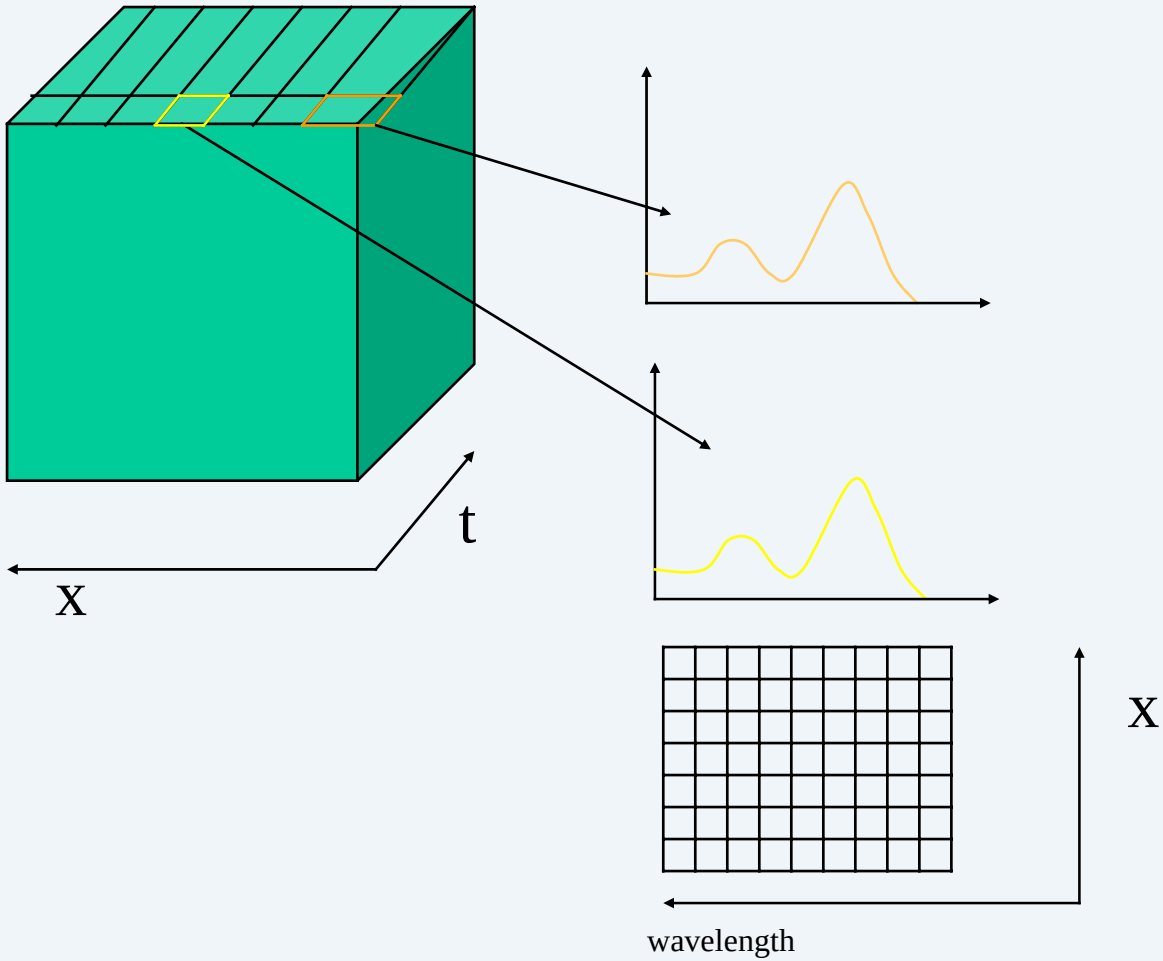
Ortsaufgelöste Spektroskopie

Qualitative Analyse -> Materialerkennung

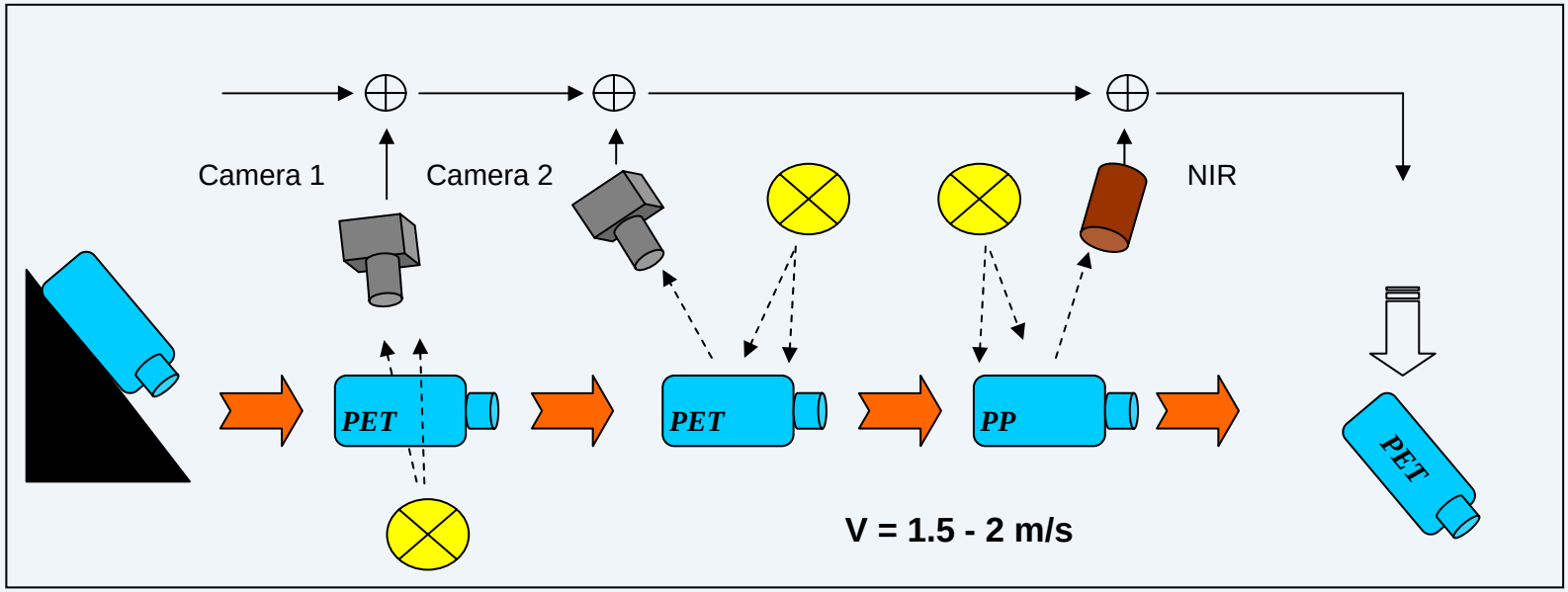
Typ. Messzyklen < 20 - 40 ms (Teile >30mm) < 1ms (Flakes)

Einsatzziele:
hohe Sortiergüten und Ausbeuten

Kunststofftrennung – ortsaufgelöste Spektroskopie



Produktionsoptimierung:Kunststofftrennung



Bloc Scheme