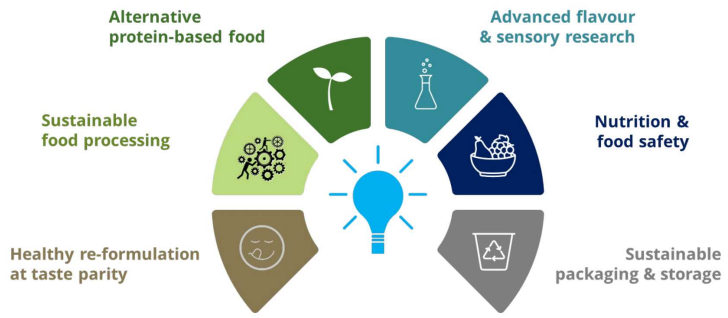
VHYC Yeast Conference 2026

Berlin; April 20 - 21



Advances in Science & Industrial Yeast Production

"On the verge of PAT & ML-Models"

in cooperation with

van Mourik GROUP | YEAST & PACKAGING

LALLEMAND BAKING

COFALEC CONFEDERATION OF EUROPEAN YEAST PRODUCERS

LEVACO CHEMICALS

Ingenieurbüro Dr.-Ing. Schoop s & h Ingenieurgesellschaft mbH DYNAMIC SYSTEMS : EFFICIENT SOLUTIONS

BlueSens understanding bioprocesses

Monday, April 20, 2026

Conference day I, all times in CEST = UTC +2h

Welcome to the VHYC Yeast Conference 2026, with the focus on ""On the verge of PAT & ML-Models" (in yeast production).

The Process Analytical Technologies (PAT) have a track records in the chemical process industry, enabling 24/7 real time monitoring. Non-destructive, Optical, Spectrometric and Wave principles and Chemometric models are well established.

The fermentation/bioprocess industries instead deal with living organism and their parameters: Growth, metabolic products, mutation as well as starvation. The choice of appropriate PAT, the interpretation of data thereof and the modeling of these processes are still challenging.

“Machine learning” (ML) and “deep learning models (architectures)” may speed up insights and conclusions. Our lecturers from applied research, industry partners and sponsors will share their project achievements on PAT & ML and even fully automated bioprocess development (KIWI lab).

We look forward to a lively exchange and a great networking event!

Mr. Antoine Chagnon,	Mr. Thomas Lotz	Presidents of VH Berlin
Dr. Michael Quantz,	Dr. Erik Pollmann	Managers of VH Berlin

10:15 a.m. Conference opening and welcome

VH Vice President Thomas Lotz

Lesaffre Germany (GER)

Applied Research

10:30 a.m. KIWI Lab: Accelerating bioprocess development with HTS analytics

Mariano Nicolas Cruz Bournazou

TU Berlin (GER)

The KIWI-biolab at the Chair of Bioprocess Engineering, Technical University Berlin has a high throughput laboratory for sophisticated bioprocess development in the small scale. Two cultivation platforms were developed liquid handling station (LHS) hosting systems for up to 48 cultivations in 10-15 mL or 8 cultivations in 100-150 mL scale. Online measurements of oxygen, pH

and off-gas, regular samplings are performed. Integration of an additional LHS and a HT-analyser allows for automated determination of the concentrations of biomass, as well as various substrates and metabolites in aqueous solutions. Connection of a flow cytometer gives valuable insights into cultivation inhomogeneities and dynamics, while the integration of a microfluidic protein characterization system and the development of enzyme-linked immuno-sorbent assays allow for analysis of the (recombinant) proteins of interest. Raman spectroscopy in HT is performed through a multi-sample-processing framework using a flow cell. Additionally, the options for metabolite and protein analytics are in development by implementation of 2D-HPLC and LC/MS GTOF systems.

The group also developed several methods to design, control and operate the experimental facility for bioprocess development. The KIWI-biolab has developed several methods to design, control and operate the experimental facility for bioprocess development which are in most cases validated with experimental runs. These include methods for Optimal Experimental re-Design for operation of the robotic facility in closed loop, model based scale-down in parallel mini-bioreactors, model based state estimation for adaptive feeding strategies. Recently hybrid and ML and active learning methods have been developed at the KIWI-biolab from deep learning and hybrid modelling for operation and scaleup.

Based on use cases from industrial cooperation projects, we will show that capabilities and potential of modern digital laboratories for bioprocess development.

Clients/Markets

11:00 a.m. On the verge of PAT & ML-models: HTS- and AI-enabled in-silico media optimisation

Martin Patz

Differential Bio (GER)

Media composition remains one of the most powerful—yet most underestimated—levers for improving yeast performance in industrial fermentation. Small changes in nutrient balance can strongly affect growth, yield, robustness, and downstream processing. However, as the number of media parameters increases, classical optimisation approaches quickly reach their limits.

This is particularly true for complex and variable feedstocks such as molasses, where batch-to-batch variability obscures causal relationships and experimental data often appear noisy or even chaotic.

In this talk, we present how Differential Bio addresses this challenge by combining high-throughput screening (HTS) with advanced machine-learning (ML) models to enable data-efficient, in-silico media optimisation. By generating large, industrially relevant datasets at microliter scale and applying tailored ML models, we can identify patterns that are inaccessible with conventional DoE approaches and transform apparent noise into actionable insights.

Beyond showcasing the core methodology, we will discuss practical pitfalls and limitations of HTS- and ML-driven media optimisation, including data quality, experimental bias, and overfitting risks. We will outline when such approaches provide a clear advantage—and when simpler, status-quo strategies remain the better choice.

Finally, we provide an outlook on the next evolution of media optimisation: continuously updated, site- and strain-specific digital twins that integrate seasonal raw-material variability and connect laboratory learnings with production via PAT. This vision moves media optimisation from episodic projects toward a living, adaptive control layer in modern biomanufacturing.

Clients/Markets

11:30 p.m. Process optimization and process robustness through digitalization and digital twins

Christoph Herwig

Lisalis (AUT)

There is a huge need to provide novel proteins allowing to feed a growing world population and which also reduces the CO_2 footprint. However, the production process needs to reach cost parity to conventional products. Hence, it needs robust, optimized and multi product production platforms to achieve scalability and cost effectiveness.

This contribution will identify the main ingredients, such as the unique combination of continuous biomanufacturing, digitalization, and control by digital twins paired with bioprocess technology domain knowledge. We will show methodologies to run recombinant protein production using microbial

hosts in continuous mode using cascaded continuously operated bioreactors. This of course requires full QbD based process understanding and advanced control algorithms embedded in digital twins, for example using nonlinear feedback linearization techniques.

The toolset comprises tools for real time estimation of productivity and automated feedback loops for continued optimization. The work is demonstrated in a fully integrated continuous 50L demonstration facility.

In addition, we will show end to end process models to stabilize the entire process chain. Those tools are based on full digitalization of inputs and outputs. Hence, Digital Transformation is also the key enabler for intensified/continuous bioprocessing.

Industry round table discussion

12:00 a.m. „AI as enabler: PAT Bioprocess perspectives“

Moderator: Volker C. Hass, Furtwangen University (GER)

Guests: Ildar Nisamedtinov, TFTAK (EST)

Mariano Nicolas Cruz Bournazou, TU Berlin (GER)

Martin Patz, Differential Bio (GER)

Christoph Herwig, Lisalis (AUT)

12:30 p.m. Lunch break

Industry views

02:00 p.m. Exhaust air treatment (BAT): Assess, decide, invest – the order is crucial

Andreas Ohligschläger

Evonik Operations GmbH (GER)

When a plant renovates its exhaust gas cleaning system, a significant investment is at stake. Before making this investment, it is essential to ensure that the cleaning units are not oversized while still complying with current and future emission limits.

This article demonstrates how the design of an exhaust gas cleaning system was supported through a PAT measurement campaign in the production plant. The goal of the campaign was to determine the combination of exhaust gas volume and composition over time at various points in the plant. Since the facility is a network of several units, the exhaust gas system is complex, and selecting suitable measurement points posed a challenge. After thorough data analysis, the emitted substances were assigned and weighted according to their sources. In some cases, measures were derived to reduce emissions directly at their source.

The results of the campaign enabled a quantitative evaluation of various scenarios for exhaust gas cleaning. The cleaning quality, acquisition costs, operating costs, and employee effort were compared to select the most cost-effective solution.

02:30 p.m. Inline Bioprocess Monitoring by Photon Density Wave Spectroscopy

Roland Hass

PDW Analytics (GER)

Photon Density Wave (PDW) spectroscopy [1] is a calibration-free approach for the simultaneous, absolute, and independent quantification of the optical absorption coefficient and the reduced scattering coefficient of highly light scattering liquids as they are often found in biotechnical processes. The virtues of PDW spectroscopy for inline process monitoring are found in its applicability to concentrated systems, systems under stirring or under flow and/or higher viscosity, time resolution in the sub-minute regime, limited issues with so-called process probe fouling, and a background entirely based on theoretical descriptions.

Examples of inline processmonitoring of *Saccharomyces cerevisiae* cultivation and beer mashing will be discussed. Other examples for bioprocess monitoring include the high cell density cultivation of *Scenedesmus rubescens*, *Escherichia coli,* and *Ralstonia eutropha*.

Applied Research

03:00 p.m. Single Raman spectroscopy and machine learning for phenotypic differentiation of yeasts and bacteria in mixed samples

Oliver Valet

mibiC GmbH (GER)

Genotypic methods such as PCR or MALDI-TOF are widely used, but often provide limited information on the current physiological state of individual cells. Here, a workflow is described that combines non-destructive single-cell

Raman spectroscopy with machine-learning-based analysis for phenotypic differentiation of microbial cells. Cells are immobilized on filters and subsequently read out optically and spectroscopically; Raman acquisition time is ~10s per cell/microbe.

A spectral database for spoilage-relevant microorganisms is presented, and laboratory-scale mixed samples are used to demonstrate that yeasts and bacteria in mixed populations can be differentiated and classified at single-cell level based on spectral/morphological features. In addition, in-situ measurements in microfluidic DEP chips (including Candida) are reported. The results indicate that Raman-based single-cell measurements combined with ML enable phenotypic differentiation in mixed samples and may serve as a complementary analytical approach for selected offline/at-line applications.

Industry views / Posters

03:45 p.m. 4 pitches (5 - 7')

"BioProcessTrainer": Advanced model based bio process operator training

Hector Yaker Moreno, Ing.Büro Dr. Schoop & s&h Ingenieurgesellschaft (GER)

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Biotechnological production of polyphosphates in baker's yeast

Philipp Demling, RWTH Aachen (GER)

Phosphate is a crucial resource needed to satisfy the food demands of the growing global population. However, phosphate rock reserves are limited, prompting a shift towards a circular phosphate economy. The baker's yeast *Saccharomyces cerevisiae* has the capability to accumulate phosphate in the form of long-chain polymers known as polyphosphates, particularly after being subjected to phosphate starvation.

Current chemical methods for synthesizing polyphosphate are energy-intensive and limited in chain length, giving biotechnological production an edge. Depending on their degree of polymerization and inherent properties, polyphosphates can be utilized in various applications across food processing, material science, and biotransformations.

Our research on polyphosphate synthesis in *S. cerevisiae* integrates fermentation process development with host strain engineering while screening industrial strain libraries. Additionally, phosphate-rich waste streams and alternative carbon sources, such as molasses, were used to enhance circularity and lower production costs. This synergistic approach simplified the fermentation process and maximized key performance indicators, enabling the high-titer production of polyphosphates with chain lengths of 200 phosphate subunits, inaccessible to chemical synthesis at large scale. Finally, the application potential of our products, as pure polyphosphate or polyphosphate-rich yeast extract, was demonstrated.

In summary, this synergistic approach facilitates efficient biotechnological production of polyphosphates, paving the way for innovative industrial applications.

Industry views / Posters

A data driven Wrapper

Martijn Visser, Van Mourik Yeast & Packaging (NED)

Van Mourik Yeast & Packaging believes that yeast product knowledge is of great importance for developing the right machines for the yeast industry, which is our added value in the baker's yeast industry. Optimizing the packaging of your yeast is of our greatest importance.

By using our process knowledge, real-time information of sensors and ensuring a good basis for operation, our equipment can optimize parameters like; yeast cream flow, extruder hopper level and block length. Because of this automation, based on data, it is possible to keep the performance of your machines up to the highest standard possible.

An example of this data gathering and usage is the updated and upgraded yeast block wrapper. By exchanging the mechanical cams for Servomotors, we can obtain a wide range of data. This data can, for example, help with (remote) service, finding errors and optimizing the wrapping of your blocks.

By constantly improving, through innovation, we aim for our machines to be designed for hygiene, engineered for performance, built for reliability and serviced for satisfaction.

Talk to Your Robots: Ease Liquid-Handling Automation

Ulf Liebal, Biotaix (GER)

Lab automation enables high-throughput bio-technological work with high precision. Liquid handling robots can process tirelessly thousand samples per hour at volumes of single drops with controlled variation and low error.

Laboratory robots listen to the language of programming code. Before they can deliver, their actions need to be coded meticulously. This requires both detailed computer knowledge as well as experience in lab routines.

Life scientists need additional training to step in, IT-departments give tickets, which are time consuming to put into action, including multiple rounds of discussions and trial-and-error runs. Consequently, lab robots run on sub-optimal code or stay idle, when otherwise they could contribute to faster developments and better results.

At BIOTAIX, we develop “VerisFlow”, an AI-chatbot companion, to democratize lab automation. The code-free platform is handled like a chatbot to describe the automation intent, or experiment protocols are loaded. The “VerisFlow” AI then generates a script to run on the robot. Thus, life scientist can easily proceed with automation.

BIOTAIX also offers the virtual laboratory “Silvio” to simulate the automation in advance. This provides more insight into required resources, the data outcome and facilitates the integration of automation into the overall laboratory procedures. Life scientists and data analysts can improve data management cycles based on the simulated data.

04:15 p.m. End of lectures

Visit & Convivial evening

04:30 p.m. Walk & Visit:

I. Group: TU Berlin Food BPTec Campus, Dahlem

II. Group: "Culinarium Exhibition space", Domäne Dahlem

06:30 p.m. Convivial evening: “Alter Krug”, Dahlem

10:00 p.m. End of day I

Tuesday, April 21, 2026

Conference day II, all times in CEST = UTC +2h

Applied research

09:00 a.m. BioHyMoDT_4.0 – Towards Bioprocess Development and Optimisation with Digital Twin Technologies and Hybrid Models

Volker C. Hass

Furtwangen University (GER)

Within industry 4.0 the optimisation of bioprocesses demands a seamless transition from raw data to Digital Twin core models. In this contribution we will present a comprehensive workflow from raw data to predictive models, supporting bioprocess development, control and process optimisation.

The workflow is supported by a software tool, comprising a new data lake, an associated interactive data dashboard, and an innovative model development environment, accelerating customised, mechanistic model development supported by a modular submodel library.

By integrating AI-driven modelling approaches, the framework also facilitates the creation of hybrid models. The powerful workflow aims at shortening the path from laboratory investigations to optimised industrial processes.

We will demonstrate, how the mathematical process models were applied in

1. model-based Design of Experiments (mDoE) reducing experimental effort by over 80% for process development and optimisation
2. Nonlinear Model Predictive Control (NMPC) to achieve high yeast biomass densities
3. assisting the performance analysis of non-ideally mixed reactors for yeast cultivations
4. the “BioProcessTrainer” for the training of operators in process & reactor operation and advanced control applications
5. soft-sensors and Digital Twins which can directly be integrated into the industrial process control and automation system “WinErs”.

Applied research

09:30 a.m. Online Machine Learning for prediction of non-stationary algae growth in outdoor photobioreactors

Eric Morelle

Technical University Berlin (GER)

Modelling and predicting the health and growth of organisms for future process scenarios is a key challenge for the optimization of bioprocess control. While established kinetics or mechanistic models provide useful and valid predictions for a wide range of conditions, they often need careful parameterization, and their transfer to new geometries, organisms or the introduction of new variables can be challenging.

The data efficient development of models becomes increasingly important with the scale of the process and the cost of data collection. Machine learning methods offer the possibility to directly learn the change rate of variables as a function of the current state and process conditions.

Microalgae in outdoor photobioreactors are exposed to dynamic weather conditions that can not always be stabilized by control measures. Therefore, modelling the growth rate with respect to the weather conditions is an important requirement for the optimization of controllable process variables like harvest rate or mixing speed.

Three machine learning models were evaluated for their short term prediction quality and their required amount of data for training. In this contribution we evaluate the performance and limitations of this approach, as well as the potential for control optimization with reinforcement learning and digital twins.

10:00 a.m. Simultaneous determination of cell age and vitality of yeast populations by atline flow cytometry

Marco Eigenfeld

Medical University of Graz (AUT)

Cell populations of industrial yeasts are intrinsically heterogeneous, and this heterogeneity strongly influences process robustness and productivity. Replicative age is a key source of this variability, as aging cells differ from younger cells in metabolic activity, stress tolerance, and survival. However, the relationship between replicative age and physiological state at the single-cell level remains poorly understood. Here, we quantify the relationship between replicative age and cell viability using a chitin-binding protein–based bud scar staining approach combined with a viability assay.

Our results reveal a direct correlation between increasing replicative age and declining viability, highlighting age-dependent shifts in population structure. This establishes a functional link between replicative history and physiological state.

Together, these findings provide a framework for incorporating age-aware analysis into microbial population studies and identify replicative aging as a critical, yet often overlooked, parameter in industrial and biotechnological yeast systems.

10:30 a.m. Coffee Break

Production & Process units

11:15 a.m. GEA's OptiPartner Intellicant®

Christian Schramm

GEA Westfalia (GER)

GEA Westfalia Separator has been manufacturing centrifuges since 1893. Today the company is developing machines and process lines for approx. 2000 different applications worldwide. PAT and ML is becoming more and more important for many applications in different industries. The case presented is demonstrating the added value for customers in waster water treatment.

GEA's OptiPartner Intellicant® transforms a wastewater decanter centrifuge into a fully data-driven, self-optimizing system by using advanced algorithms paired with process knowledge. It continuously gathers real-time information from sensors (e.g., solids content, turbidity, feed variability) and identifies how operating settings influence the resulting process quality. Using this understanding, the system automatically adjusts key parameters like differential speed, polymer dosage and flow rate of the machine. Instead of relying on fixed rules or manual intervention, it uses an adaptive, feedback-based approach that keeps performance at its optimum, even as conditions change.

One major learning from developing GEA's Intellicant® decanter in the wastewater industry was involving customers in a very early stage and therefore fully understanding their specific needs. A comparable product could be transferred into the case of the yeast industry by involving pilot customers. Recent developments in sensor technology offer interesting opportunities for optimizing production or cleaning processes.

11:35 a.m. Enabling real time yeast PAT, combining Ultrasonic trapping and inline spectroscopy

Stefan Radel / Christoph Gasser

usePAT (AUT)

The application of so-called radiation forces exerted on suspended particles in an ultrasonic standing wave have been described since the middle of 1980s. Early studies about these forces were investigating the manipulation of suspensions, in case of cells in culture for filtration purposes in bioprocesses. Subsequently the possibilities of using the technique to enhance measurements were investigated, initially especially the ability of the ultrasonic field to facilitate "stability" of the sensor – i.e. maintain a clean sensing surface.

The capabilities of ordering cells in free suspension by ultrasonic fields together with spectroscopy methods led to two approaches. Firstly, the contact-less collection of cells enables one to present the concentrated aggregates to the measurement device increasing the sensitivity significantly. This is especially true for the Raman spectroscopy, which is inherently insensitive due to the weak nature of the effect. The ultrasonic trap enabled the acquisition of Raman measurements of the cells directly within the culture.

Secondly, by adjusting the acoustic frequency it is possible to reliably control the position of the cell aggregates, e.g. in relation to the sensing surface of ATR FT-IR. This enabled the population and depopulation of the evanescent field with yeast, leading to insights of the chemical composition of yeast cells during a fermentation.

All measurements were carried out in-line, i.e. eliminating the need of taking samples. This ties closely into the concepts of PAT and provides a novel approach for generating high quality process data.

Industry views / Posters

12:00 p.m. 4 pitches (5 - 7')

Replicative Lifespan–driven separation of industrial fermenting strains by cell age

Komal Dhull, Austrian Centre of Industrial Biotechnology (AUT)

Active Dry Yeast (ADY) is widely used in industrial fermentation processes such as brewing, baking, and bioethanol production. However, its viability after

drying and rehydration remains limited (20–70%), reducing process efficiency and productivity. A key contributing factor is population heterogeneity, particularly differences in replicative age.

In *Saccharomyces pastorianus*, younger cells exhibit significantly higher metabolic activity than older cells, highlighting replicative age as a critical quality attribute (CQA) that directly impacts fermentation performance. To address this, a replicative lifespan–based separation strategy is proposed to enrich younger cell populations.

At laboratory scale, magnetic separation has been successfully used to isolate yeast cells based on age by labeling age-specific surface markers and selectively separating them with magnetic beads.

For industrial implementation and upscaling, fluidized bed chromatography is introduced as a continuous and scalable technique suitable for large-scale biomass processing. Within a Process Analytical Technology (PAT) framework, replicative age can be quantified using at-line flow cytometry–based single-cell analysis, enabling real-time monitoring of population dynamics.

Based on these measurements, data-driven approaches, including machine learning models, can be applied to classify cell populations, predict fermentation performance, and support process control strategies. This enables data-driven monitoring and control of population heterogeneity, improving robustness and consistency in industrial yeast production processes.

Industry views / Posters

Automated holographic microbiological on-line monitoring

Barbora Kobidova, Holloid GmbH (AUT)

Real-time monitoring of yeast dynamics is critical for optimizing fermentation processes and ensuring product quality. In this study, SafAle S-04 yeast was characterized using 3D label-free holographic microscopy platform with high-throughput developed by Holloid.

The system enables continuous, on-line acquisition of three-dimensional data by reconstructing holograms of microscopic objects, allowing quantitative analysis without the need for staining or sample preparation.

Yeast growth was quantified in real time through automated object counting, enabling the generation of growth curves and improved temporal resolution compared to conventional offline methods. In addition, a machine learning model was trained to classify some yeast populations, successfully distinguishing different yeast types based on morphological and structural features extracted from holographic data.

The results demonstrate that Holloid's technology provides a powerful tool for simultaneous quantification and characterization of microbial populations, offering enhanced process insight, faster detection of changes and improved control of fermentation systems.

ZIM project "Yeast Control": Digital modelling and a predictive feed control in baker's yeast fermentations

Jonathan Sturm, BlueSens / Ulf Liebal, WHS / Louis Horstmann, VH Berlin (GER)

In our poster, we present the current status of the ZIM project "YeastControl". The project integrates process knowledge from multiple sources, with consortium partners applying complementary bioprocess modelling strategies:

BlueSens develops an adaptive kinetic process model to capture mechanistic behaviour and the Westphalian University of Applied Sciences focuses on data-driven modelling to exploit information contained in real-time process data. Finally, the process knowledge and industrial expertise of VH Berlin ensures that the project findings are applicable and easily transferable to industrial conditions.

The overarching goal is to enable a model-assisted process control strategy that surpasses the current state of practice by being not only reactive but also predictive. The implications for process analytical technology (PAT) and machine-learning-based methods in the yeast industry are shown.

"Enabling AI in Bioprocessing: How High-Quality Data Drives Smarter Decisions"

Holger Müller, BlueSens Gas sensor GmbH (GER)

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12:45 p.m. Feedback & Farewell

VH President Antoine Chagnon

Lallemand Inc. (CAN)

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01:15 p.m. Conference Lunch

02:30 p.m. End of conference / day II