

Pixact Crystallization Monitoring

The Pixact Crystallization Monitoring (PCM) technology is designed for the online measurement of crystallization processes. The technology combines in-situ process microscopy with advanced image analysis techniques.

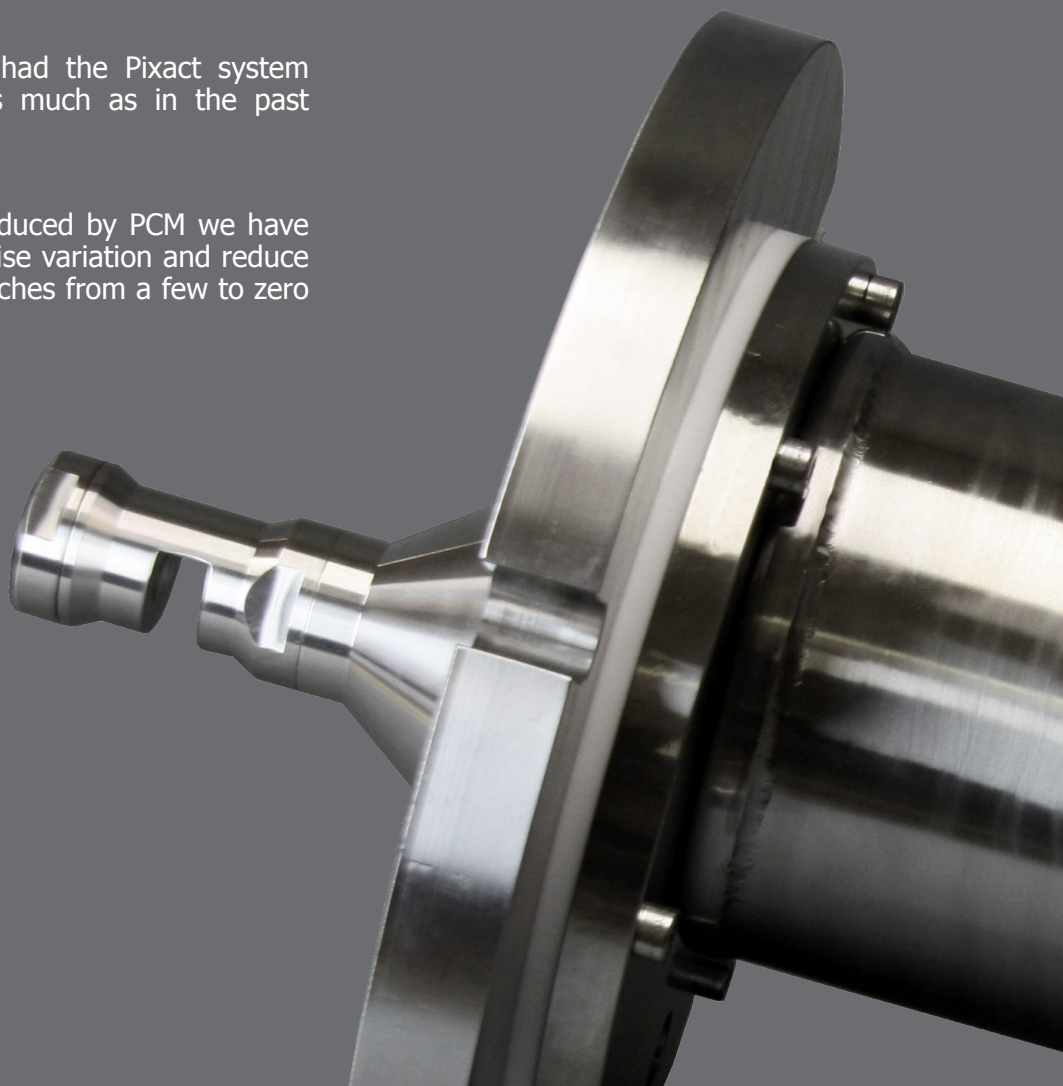
PCM provides a live camera view of the process and detailed measurement data on crystal characteristics, such as size distribution, morphology and concentration.

Equipped with flexible installation mechanics, PCM can be fitted into a variety of equipment from laboratory to manufacturing scale reactors and crystallizers.

Plant managers' experiences with PCM

“In the six months we have had the Pixact system installed we have learned as much as in the past decade.”

“With the help of the data produced by PCM we have been able to decrease batchwise variation and reduce the number of out-of-spec batches from a few to zero per week in just six months.”



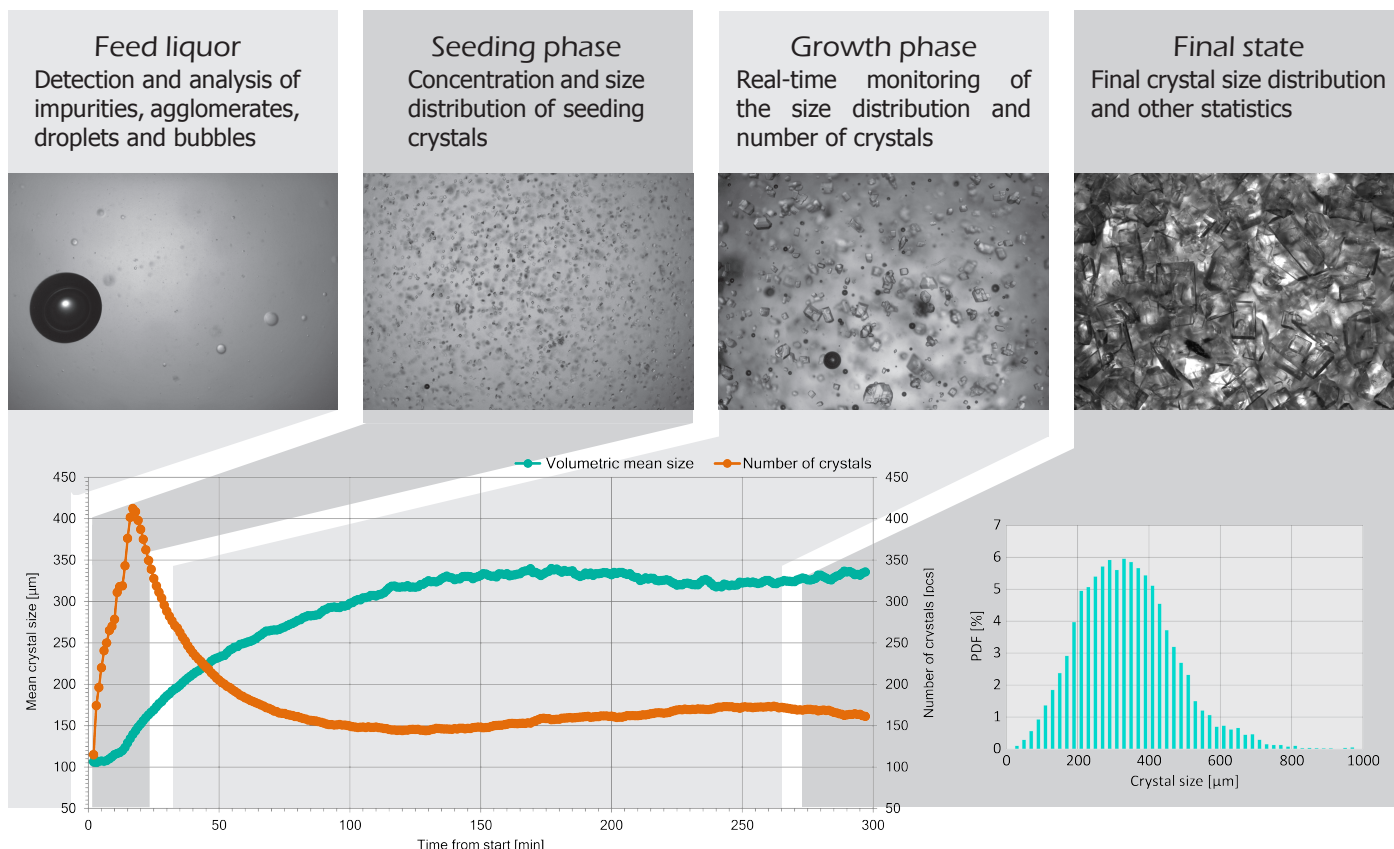
Measurement results

The foundation of PCM is the live image view, which provides you with valuable visual information on your process.

Furthermore, the proprietary image analysis algorithms of the measurement system detect crystals and other particles in the image data and produce detailed real-time numerical information on their characteristics as well as other suspension properties.

The measurement results produced by PCM include:

- Crystal size distribution and related statistics (mean and standard deviation; D10, D50, D90, etc.; fractions of fine and coarse crystals)
- Crystal growth rate
- Crystal morphology
- Number of crystals and nucleation rate
- Suspension flowability



Benefits

The measurement information produced by PCM helps you to optimize, control and troubleshoot your process efficiently. With PCM you can increase the yield and capacity of your process and minimize quality variations in the final product.

For the operator, PCM provides tools for

- Visual examination of the crystal suspension with a live camera view (featuring zoom, pause, etc.),
- Immediate evaluation of the seeding phase and making decisions on further actions such as reseeded,
- Online monitoring of crystal characteristics, including fractions of fine and coarse crystals,
- Detection of secondary nucleation and crystal dissolution, and

- Batchwise reporting of complete statistics, time trends and distributions.

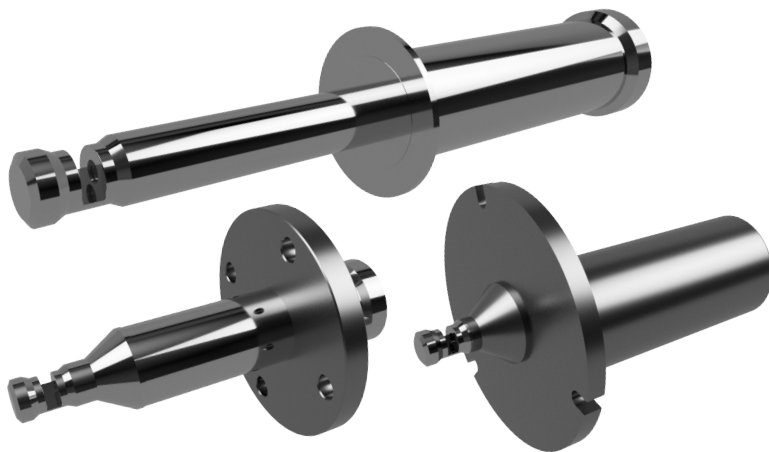
To increase productivity and promote Best Practice methods, you can use PCM in production development for

- Benchmarking individual reactors and recipes,
- Comparing plants with each other,
- Collecting a production database to help with troubleshooting in case of disturbances,
- Supporting lab-scale R&D work by providing new insights into crystallization dynamics and related physical phenomena, and
- Supporting scale-up work by using the same measurement equipment from the laboratory to production.

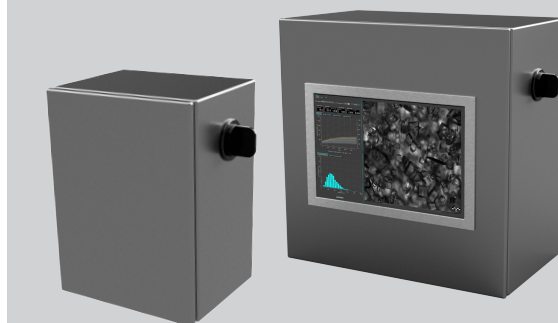
PCM measurement hardware and software

The PCM hardware consists of a Pixscope probe and a Pixstation main unit.

The measurement probe showcases modular design, which allows the system to be fitted into a wide variety of applications from laboratory to manufacturing scale reactors.



The Pixstation main unit includes a PC workstation and an automation gateway. The main unit can be customized with optional features, such as a monitor for local operation and a complete selection of automation interfaces.



The PCM software is an all-in-one tool for analyzing and reporting measurement data.

The PCM software controls the measurement procedure from data acquisition to the reporting of results. You can use it as both a fully automated online measurement software and an effective R&D tool with access to all necessary settings as well as manually controlled data acquisition and analysis.

Key features of the software

User-friendly adjustment of imaging parameters

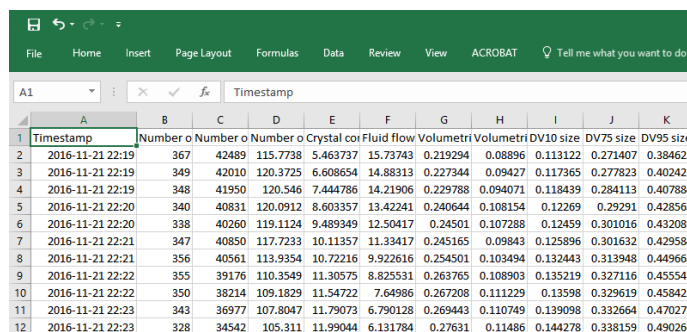
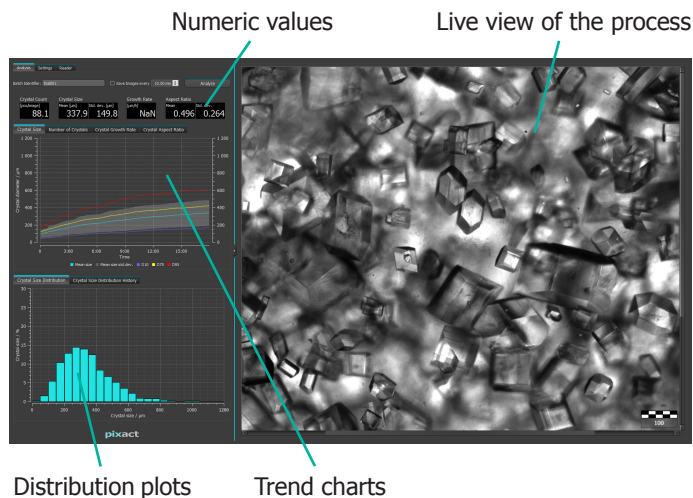
- Automatic camera controls
- Adjustable image refresh frequency
- Zoom and pause of the live view

Powerful analysis algorithms

- High-performance image analysis algorithms that convert the image stream into real-time quantitative information
- Customized image analysis features on request

Flexible reporting tools

- Image data can be stored on an internal or external hard drive
- Results exported in Microsoft Excel® or CSV format
- Internal database for the measurement results




The screenshot shows a Microsoft Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J	K
1	Timestamp	Number o	Number o	Number o	Crystal coi	Fluid flow	Volumetri	Volumetri	DV10 size	DV75 size	DV95 size
2	2016-11-21 22:19	367	42489	115.7738	5.463737	15.73743	0.219294	0.08896	0.113122	0.271407	0.384621
3	2016-11-21 22:19	349	42010	120.3725	6.608654	14.88313	0.227344	0.09427	0.117365	0.277823	0.402421
4	2016-11-21 22:19	348	41950	120.546	7.444786	14.21906	0.229788	0.094071	0.118439	0.284113	0.407884
5	2016-11-21 22:20	340	40831	120.0912	8.603357	13.42241	0.240644	0.108154	0.12269	0.29291	0.428565
6	2016-11-21 22:20	338	40260	119.1124	9.489349	12.50417	0.24501	0.107288	0.12459	0.301016	0.432089
7	2016-11-21 22:21	347	40850	117.7233	10.11357	11.33417	0.245165	0.09843	0.125896	0.301632	0.429584
8	2016-11-21 22:21	356	40561	113.9354	10.72216	9.922616	0.254501	0.103494	0.132443	0.313948	0.449668
9	2016-11-21 22:22	355	39176	110.3549	11.30575	8.825531	0.263765	0.108903	0.135219	0.327116	0.455547
10	2016-11-21 22:22	350	38214	109.1829	11.54722	7.64986	0.267208	0.111229	0.13598	0.329619	0.458423
11	2016-11-21 22:23	343	36977	107.8047	11.79073	6.790128	0.269443	0.110749	0.139098	0.332664	0.470272
12	2016-11-21 22:23	328	34542	105.311	11.99044	6.131784	0.27631	0.11486	0.144278	0.338159	0.490266

Technical specification

System description	Online measurement system for the real-time analysis of crystallization processes		
Measurement principle	Direct optical imaging of the crystal suspension accompanied by proprietary image analysis techniques		
Optical configuration options	M=1	M=2	M=4
Image area [mm]	8.5 x 7.0	4.3 x 3.5	2.1 x 1.8
Image resolution	3.5µm/pix	1.7µm/pix	0.85µm/pix
Measurement range	20...2000µm	10...1000µm	5...500µm
Power supply	All system components 24VDC, power supply unit 230VAC/50Hz		
Automation input / output	Profibus, Modbus, Analog (mA, V), Digital (5-24VDC)		
Installation	Directly on the process equipment using DN25 or larger fittings. Custom adapters for existing inlets can be delivered. All magnifications are not available for all installation options.		

Environmental protection	IP67, ATEX on request
Operating temperature	Probe tip: -20C to +120C Housing: -20C to +85C (cooling options available)
Max. oper. pressure	4 bar
Probe dimensions	
Diameter (D)	Min. 25mm, standard 31mm
Length (L)	Max. 300mm, standard 100mm
Measurement gap (G)	1-20mm (fixed, not adjustable)
	
Materials	
Probe head	Stainless steel AISI316L (other materials on request)
Optical windows	Sapphire or borosilicate
Sealing options	NBR, PTFE, FPM, EPDM, silicone

Our services

We support our customers from the evaluation of the new measurement technology until the company-wide roll-out in the manufacturing scale. Our services help you to utilize new measurement data and reach your productivity and quality targets faster.

Our services include

- Measurement services in the customer's laboratory, pilot facilities or manufacturing scale process
- Long-term measurement campaigns in pilot and manufacturing scale
- Rental of measurement systems
- Installation and commissioning of the complete system

We also provide comprehensive support and maintenance services for the Pixact measurement systems. The scope of the service can be adjusted to your needs.

Our support and maintenance services include

- Remote connection to the measurement system for user support, system diagnostics and software updates
- Service visits to the site (regular or on-demand)
- Hardware maintenance program supporting the continuous operation of the system
- Training for the system users
- Further development of the software or hardware

More information



For more information on the PCM technology, scan the QR code with your mobile device or visit pixact.fi/crystals.

Interested in utilizing the Pixact technology in another type of application? Read more about our solutions at pixact.fi/solutions or contact us directly.

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Company

Pixact develops and supplies novel process measurement technology based on optical imaging. Our mission is to provide new tools for the process industry to improve process control and facilitate the streamlining of process operations.

Our competence in online process diagnostics is based on

- Superior image quality even in dense and dark process suspensions
- Advanced image analysis algorithms for real-time data processing
- Tailor-made hardware and software solutions