ISSUE 3 / 2012

PANalytical

X'PRESS

The customers' voice

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10 years

The Analytical X-ray Company

Automated solutions

Welcome to the latest issue of X'Press.

In this final issue of X'Press for 2012 I would like you to get acquainted with some of our automation solutions for industrial applications and on-line elemental analyses. Automation solutions increase productivity, improve efficiency and ultimately lead to substantial and sustainable cost savings and in this way we will continue to strive for improving your business. But, implementing an automated analytical solution is a complex process that needs specialists, flexible hardware and integrated software; fields we have solid experience in.

PANalytical automation solutions start with sample preparation – minimizing operator input, speeding up the process and saving cost. Robust analytical instruments form the foundation of a successful installation, with flexible control and data handling software plus accessory hardware completing the package. The PANalytical team has installed numerous automated systems across the world over the years, and 2012 has been no exception. In this issue of X'Press we introduce you to the recently finished project for DEW in Germany as an example, and we are currently working with ArcelorMittal (Germany) on an even larger automation project.

Other highlights in this issue: the PIXcel^{3D} 2x2 has been added to the PIXcel family, offering unmatched resolving power and an extraordinary field of view.

The PANalytical China User Club meeting in September was a resounding success, with more than 230 participants. Similarly, XRD workshops focusing on the mining industry were held at the Federal University of Pará in Brazil, familiarizing potential customers with our products and their benefits for the mining industry. The planning for a 2013 workshop is already underway, as are the details of the 5th Building Materials Analysis (BMA) Conference, in Halle, Germany, scheduled 18-20 March, 2013.

2013 looks set to be an exciting year in which we will be proud to serve you as best as possible. I look forward to working with you in the next year, and for now Season's Greetings!

With best regards,
Peter van Velzen
Managing Director

We welcome any questions or comments you may have; please send them via info@panalytical.com

Latest news

At the time of going to press of this edition it was announced that PANalytical acquired ASD Inc. For further details we invite you to visit the PANalytical website: www.panalytical.com/news/press releases

Continued success for DEW

Part of the Schmolz + Bickenbach Group, Deutsche Edelstahlwerke GmbH (DEW), with 11,000 employees, is the world's largest manufacturer, processor and distributor of specialty steel alloys and long products. Their expert reputation is built upon 150 years of experience, combined with modern facilities and highly trained staff. With sites in Witten, Siegen, Krefeld, Hagen and Hattingen (Germany), DEW produce and process around one million tonnes of specialty steel every year.

In 2007, with PANalytical's expertise, DEW's Siegen lab was rebuilt to accommodate a PANalytical TEAMworks system. When renovation of the Witten site took place, PANalytical were again asked to contribute to the joint project with the Wuppertal-based company FLSmidth. The renovation enabled the installation of a fully automated PANalytical laboratory including a complete sample preparation cell, analysis cell, PANalytical TEAMworks system (already in use), MPA slag preparation and a pneumatic tube system provided by FLSmidth Wuppertal. The system uses the state-of-the-art PANalytical-FANUC metal sample preparation system and is governed by PANalytical's SamTracs control system, whilst analysis is completed by PANalytical's MagiX FAST and OBLF OES spectrometers, coupled to an Impromat gamma spectrometer.

DEW's Witten laboratory manages the demanding analysis of a wide range of samples over very short periods of time. With PANalytical's renovations it can now easily process 100 steel samples with a hardness between 100 HB and 60 HRC, and 20 slag samples 24 hours a day. Delivering steel and slag samples from 7 sending stations to 4 receiving stations, the pneumatic tube system cuts transportation times down to 18-32 seconds. Only 4 minutes after sending the sample, the complete OES and XRF analysis is received.

Samples are automatically unpacked in the laboratory and passed to the PANalytical automation for processing. Slags are processed in the MPA slag preparation, while hot steel samples are cooled by PANalytical's unique P&K cooling machine which takes each sample's TTT-diagram (time-temperature-transformation) into account. After machining by the FANUC CNC milling machine, each sample's surface is inspected by PANalytical's PSI-software and handed over to an OES or XRF system for analysis.

The data is then sent to both the LISA LIMS system and the operator's station. Samples that need to be checked for radioactivity will also be measured. All samples are subsequently automatically labeled and organized.

After a successful installation during July and subsequent commissioning, the system was deemed fully operational on the 26th of July. Final acceptance of the system was signed on 22nd of October 2012 after an excellent test period.

DEW products range from drawn wire, 0.8 mm in diameter, to forged products, up to 1100 mm in diameter, for the automotive and aerospace industries, mechanical engineering, energy management and plant technology.

Products include:

- Tool steels
- Stainless, acid- and heat-resistant steels
- High-grade structural and anti-friction bearing steels
- Special materials such as ferro-titanit (carbide-alloyed materials)

From left to right: Dr. Mathias Schäfer (PANalytical GmbH), Mark Pals (PANalytical B.V.) Dr. Sascha Janosch (DEW), Wolfgang Weber (FLSmidth), Heinz Sepke (FLSmidth)

Expertise in metal ore recovery

Stillwater Mining has been a customer of PANalytical for more than 20 years. They operate Stillwater and East Boulder mines, both located on the J-M Reef in south-central Montana with plants located at both mines to upgrade ore to a concentrate. Stillwater Mining also operate a smelter and refinery to further upgrade the concentrate to a platinum group metal (PGM)-rich filter cake.

The company's mining operations have built a trusted relationship with PANalytical while using multiple generations of WDXRF instruments, including PW1480s, X'Uniques and MagiX. This made it easy to rely on PANalytical again, when the company entered the autocatalyst recycling business. Stillwater Mining have become experts in platinum and palladium metal ore recovery, specializing in platinum group metal recycling.

Already convinced of the benefits of XRF, Stillwater Mining were eager to adopt the Epsilon 5 polarized EDXRF instrument because of its unique performance for platinum group metals, the result of high-energy excitation and low background noise from the polarization optics. As low levels of detection and precision could be achieved with the Epsilon 5, Stillwater Mining ambitiously set out to improve efficiency and reduce overall analytical throughput time.

When the Epsilon 5 proved its capabilities, three additional instruments were purchased and the company invested in an automation project to prepare sample pellets, and deliver them to the Epsilon 5. PANalytical expertise helped to establish impressive long-term stability and a high degree of consistency between instruments.

Scan the QR code for a video about the automated lab

www.youtube.com/watch?v=wZd88sT0CGQ

Spent auto catalysts

A significant reduction in analytical labor, between 1/3 and 1/2 depending upon activity, and reduced sample throughput time from two weeks to a few days have been achieved. Put through a series of stringent evaluations, the automated Epsilon 5 lab meets quality requirements resulting in improved customer confidence. It can also be adapted for other precious metals (gold and silver) and rare earth element beneficiation applications.

The four Epsilon 5 in the automated recycle lab

Stillwater Mining's new automated recycle lab, commissioned in February 2011, is a state-of-the-art assay lab utilizing an automated X-ray process for more accurate results and faster processing times than conventional methods. The dedicated automated recycle laboratory, coupled with the new sampling plant, provides exchange quality assays within 7 to 10 days of receiving the material. This efficiency provides suppliers with the fastest exchange quality assays in the market, which reduces risks caused by lengthy traditional assay times.

From left to right:
August Petersen, Lab General Foreman; Brian Parkins, Method Development Analyst; William Stearns, LIMS Analyst; Damien Smith, Sales Engineer (PANalytical)

CNA system installed at KJS Cement

In the spring of this year PANalytical's first order of a CNA analyzer was successfully installed on the site of KJS Cement in Maihar (north of Central India).

KJS Cement was first incorporated in 1983 as Diwan Lime Company for extracting limestone. The company subsequently changed its focus and name to KJS Cement Ltd. in 2007 to build an integrated 2.27 million ton cement plant in Maihar.

The Sodern CNA on-line elemental analyzer was part of a bundle deal consisting of an Axios^{mAX}, CubiX^3, MiniPal 2, Eagon 2 and a Herzog sample preparation equipment for this major project. It will be used on the company's limestone belt to continuously measure and analyze the stockpile to achieve the desired grades as well as to maintain consistency in raw materials.

Being a green field project with no pre-existing facilities available, the PANalytical team encountered numerous challenges with regard to site preparation. For instance, several major cabling work and mechanical structures had to be personally set up and supervised by the team consisting of both customer support and product specialists from PANalytical. Additionally the team had to put up with the rather harsh living conditions at the remote site.

PANalytical's Jerome Gondeau, Austin Maxwell (back row in sunglasses) and Rajendra Mishra (front, left) sharing a proud moment together with staff from KJS Cement after the installation

After two weeks the CNA analyzer was physically installed and all communication links established. The control PC was placed in the laboratory which is more than 500 m away from the analyzer. After a satisfactory recalibration and performance check, a hands-on training was given for KJS operations team, focusing not only on routine operation but also on maintenance of the analyzer.

The final commissioning was a real moment of joy and satisfaction with the teams from KJS Cement and PANalytical who were present at the signing-in ceremony. Especially the constant neutron flux output that results in drift-free analytical performance is highly appreciated by KJS Cement.

On-line elemental analysis for Companhia Nacional de Cimento, Brazil

"Brennand decided to purchase an on-line elemental analyzer to help manage our quarry's challenging chemical variation. We knew that real time information from the quarry would be critical in order to build high quality stockpiles on target for our new plant. We chose the PANalytical/Sodern CNA because we felt that this product would be ready for full operation faster than the others. In addition, the other systems did not offer the same level of personnel safety and required importation and maintenance of highly radioactive materials at our facility.

The fact that PANalytical has the local resources and reputation to stand behind and fully support the analyzer also helped us decide on the CNA.

We were pleased that our CNA commissioned and was fully operational in just three weeks after delivery and has since shown excellent analytical performance. The CNA has played a key role in the creation of limestone/ clay stockpiles, helping us tighten our control on LSF, iron modulus, and alumina modulus. As well, the CNA helps us do a much better job managing the quarry while making the best use of our higher and lower grade materials."

Paulo Roberto Zscaber
Production Manager
Brennand Cimentos

Creating conditions for the perfect fused bead

The ground-breaking PANalytical Eagon 2 bead machine is now integrated within QCX® DCF820, a new generation of state-of-the-art sample preparation and automated fused bead preparation instruments. The QCX® DCF820 is available from FLSmidth in different models according to the degree of automation and sample capacity required.

The QCX® DCF820 combines the three sub-modules for fused bead manufacturing in a single fully automated system.

1st flux dosing → Sample weighing → 2nd flux dosing → Mixing → Fusion → Bead casting → Test of bead integrity → Crucible cleaning → Crucible drying

During the first step of fused bead preparation, the correct quantities of flux and sample are dosed gravimetrically into a clean crucible. The pre-dryed flux is then dosed via a heated system in order to guarantee the same mixing ratios for the prepared sample. To ensure the best possible start, mixing and dosing takes place in the following sequence: 1st flux dosing, sample dosing, and 2nd flux dosing. The exact ratios are then sent to the XRF spectrometer for subsequent analytical calculations.

Next, the sample is fused using one or more PANalytical's Eagon 2 systems depending on the required sample throughput. The QCX® DCF820 automatically selects the most suitable Eagon 2 fusion program for the material in question (with programmable parameters like pre-oxidation steps, temperatures, times, mixing parameters and releasing agent injection time).

When the fusion process is completed, the fused bead is automatically cooled so it can be directly loaded into the XRF spectrometer.

In the last step of the process, the crucible and casting dishes are cleaned according to international standard requirements. Thus cross-contamination is avoided and the best possible fused bead can be produced. The instrument is then ready for the next cycle.

This fully automated sample preparation system guarantees the best laboratory practices combined with the best-in-class equipment. With the highest possible efficiency you can realize the optimum conditions needed for accurate and robust XRF analysis.

PIXcel^{3D} 2x2 – Super sharp vision and a large field of view

Scanning 2D micrograph from one of the brown layers of the stalagmite

PANalytical introduces the PIXcel^{3D} 2x2 detector with solid-state hybrid technology, the big brother of PANalytical's ground-breaking PIXcel^{3D}. Not only does it have an unmatched resolving power and the same high dynamic range, but the PIXcel^{3D} 2x2 also has an extraordinarily large field of view up to 28.8° 2θ in static mode. The field of view can be expanded further by the PIXcel^{3D} 2x2's unique 2D scanning capabilities.

Perfectly suited to 2D area scanning and 3D tomography detection, the PIXcel^{3D} 2x2 also offers point (0D) and fast line (1D) scanning. Like the PIXcel^{3D}, in elegant light-weight casing the PIXcel^{3D} 2x2 is a highly versatile, state-of-the-art piece of technology where the novel 'PreFIX-on-PreFIX' design enables rapid exchange of anti-scatter slits.

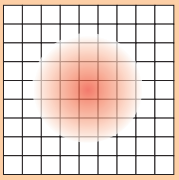
As a partner of the Medipix2 consortium consisting of 16 leading research institutes including the European Institute for Fundamental Particle Physics CERN in Geneva, Switzerland, PANalytical has exclusive access to their revolutionary technology for analytical X-ray applications. The new detector consists of two main parts:

- four readout chips with in total 512 x 512 (262,144) independent counters which are placed extremely close to each other,
- one large sensor chip covering all four readout chips.

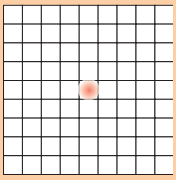
The PIXcel^{3D} 2x2's unrivalled resolving power is characterized by its pixel size, point spread function and sensor thickness. The pixels measure only 55 µm x 55 µm and the point spread function is less than a pixel unlike with other detector technologies, particularly those where an amplifier gas is involved. On the PIXcel^{3D} 2x2 one photon triggers only one pixel resulting in unparalleled image sharpness. Additionally the sensor thickness is only 300 µm, allowing to bring the detector very close to the sample without parallax effects seen in deeper, gas filled detectors.

What is point spread function (PSF)?

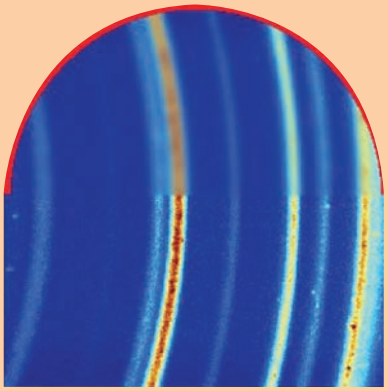
PSF is a function which, in the case of an X-ray detector, describes the influence of one incoming photon on neighboring pixels. PSF can have profound effect on the achievable resolution of a detector, as it imparts a blurring effect when this value is high, such as is the case for detectors containing gas for amplification. For example if a detector's PSF is 250 microns and the detector pixel size is 70 microns, one incoming photon will influence more than 16 neighboring pixels.



PSF of 250 micron



PSF of 55 micron



Top: 2D XRD image with simulated 250 micron point spread function (PSF)

Bottom: PIXcel^{3D} 2x2 with no blurring PSF effect

Find out more by scanning the QR - code

www.panalytical.com/pixcel3d2x2

Mining Brazil

Workshop

On July 11 and 12 an XRD workshop for the mining industry was held at the Federal University of Pará (UFPA) in Belém/PA in the north of Brazil. This region is one of the world's largest mining districts with sources for almost all ores and minerals such as base metals, iron, precious metals and rare earth minerals.

The workshop was organized by Prof. Dr. Rômulo Angélica from the UFPA and Dr. Luciano Gobbo, XRD application specialist LATAM from PANalytical Brazil. More than 60 registered participants, not only from companies already familiar with XRD (for example Albrás, Alunorte, IFMA, IFPA, Mineraçao Paragominas, Vale), attended the highly informative and exciting talks delivered by speakers from the UFPA, research institutes and PANalytical. The topics included: Geological potential and mineral resources in the Amazon, Principles of X-ray diffraction, HighScore Plus software in qualitative and quantitative analysis of minerals, the use and benefits of XRD in the mining industry as well as a few examples of XRF applications. A special focus was put on aluminium – from bauxite ore to metal aluminium.

Also in July the first XRD training course was given in the recently completed training center of PANalytical Brazil in São Paulo. Prof. Dr. Fábio Ramos Dias Andrade from the University of São Paulo together with PANalytical's Dr. Luciano Gobbo instructed a full class of participants and they are already planning the next course for 2013.

Speakers at the mining workshop from left to right:
Prof. Dr. Fábio Ramos Dias Andrade (Instituto de Geociências, USP),
Prof. Dr. Thomas Scheller (Instituto de Geociências, UFPA),
Dr. Uwe König (PANalytical), Dr. Frank Feret (Consultant),
Jacqueline Lillo (PANalytical),
Prof. Dr. Herbert Pöllmann (University of Halle, Germany),
Dr. Luciano Gobbo (PANalytical),
Prof. Dr. Henrique Kahn (Laboratório de Caracterização Tecnológica, USP),
Profa. MSc. Simone P. Aranha da Paz (Faculdade de Engenharia de Materiais, UFPA),
Prof. Dr. Oscar Choque (Instituto Federal do Pará, IFPA),
Prof. Dr. Rômulo Simões Angélica (Instituto de Geociências, UFPA), and
Prof. Dr. José Manuel Rivas Mercury (Instituto Federal do Maranhão, IFMA)

Testimonial

At that time data acquisition and treatment were analogical. X-ray diffractograms were printed and interpretation (search-match) was carried out using old ICCD-JCPDF paper cards. And it worked! I could never imagine the amount of technological changes in such a short time and I did not know then that I would ever head this lab as a professor from 1999 on.

In 2006 we received a brand-new X´Pert PRO MPD diffractometer with the X´Celerator detector, a revolution in terms of speed of data acquisition. It considerably increased the number of samples analyzed in our laboratory.

Later the system has been upgraded with sample changer, automatic divergence slits and an Anton Paar HTK 16N temperature chamber. In 2007 we purchased an Axios^{mAX}-Minerals XRF spectrometer. At times, when we needed technical assistance PANalytical has never failed to help us, even sending technicians to resolve problems with our equipment (Belém is more than 3,000 km far from São Paulo).

After many invitations to talk at XRD workshops I am now proud to have organized the first XRD workshop in the Amazon Region, sponsored by PANalytical.
Because of all these years together, I consider my relationship with PANalytical as a true family. And I hope to continue this partnership for many years.

Prof. Dr. Rômulo Simões Angélica, University of Pará

From left to right: Student André, Dr. Luciano Gobbo, Profa. Simone P. Aranha da Paz , Prof. Dr. Rômulo Simões Angélica

ICSOBA Brazil

In October The International Committee for Study of Bauxite, Alumina and Aluminium (ICSOBA) held its 19th symposium and exhibition in Belém. Presided by Dr. Frank Feret a highly interesting technical program, covering most aspects of the aluminium industry, was combined with excursions to operations in the region.

PANalytical was one of the sponsors of this symposium, which was attended by more than 300 delegates following more than 100 presentations. Dr. Uwe König (XRD product specialist, Almelo, the Netherlands) gave a well-received talk about XRD grade control on bauxites.

ICSOBA 2013 will be held 4-6 September 2013 in Krasnoyarsk (Siberia, Russia).

Lively discussions at the PANalytical desk

Conference organizers Dipa Chaudhuri and Dr. Frank Feret, flanked by PANalytical's Dr. Micaela Longo and Dr. Uwe König

Conference excursions to the Paragominas bauxite mine in northern Brazil, on of the world's richest sources of bauxite

XRD at the museum

The Royal Institution (Ri) in London (UK) is second in a series in X'Press about museums in the United Kingdom who have recently invested in PANalytical X-ray diffraction systems to advance their research programs.

The Royal Institution was founded in 1799 to advise the government of the day on scientific matters. Many world famous scientists such as Michael Faraday and Humphrey Davy worked at the Ri. Nowadays it is well known in the UK for hosting the famous Christmas Lectures (now televised) which seek to bring the fascinating world of science to enthuse a young audience. The Institution is not only home of some advanced research but also houses a historical record of scientific achievement and apparatus like the recreation of Faraday's magnetic laboratory as it was in the 1850's.

Next to Faraday's lab the Ri has a state-of-the-art laboratory housing their PANalytical X'pert MPD diffractometer. This machine is in full view of the public and scientists can be seen at work.

The installation of the X'Pert PRO is quite fitting as this institute was also home to Sir William and Sir Lawrence Bragg (winners of the 1915 physics Nobel prize for their work on X-ray diffraction).

Ri staff use the MPD to characterize a range of novel materials including investigations of the phase changes caused by varying preparation regimes of biomedically important compounds. One of the current themes is the research into the use of magnetic compounds used as tracers to help locate lymph nodes close to cancer tumors in humans. This has previously been done by strong dyes or radioactive materials – with undesirable side effects. The iron and gold nanoparticles used in this research have their properties investigated by X-ray diffraction.

PANalytical X'Pert MPD on public view in the Ri Exhibition

Magnetic nanoparticles could also be used to track neural stem cells after a transplant in order to monitor how the cells heal spinal injuries.

Neural stem cells are a promising treatment for repairing spinal cord injuries as they have the ability to generate tissue, but there is no effective way of monitoring the cells for long periods of time after transplantation.

The actual installation of the X'Pert system proved to be exciting: The Ri building is essentially a Grade 1 listed building in an affluent part of Central London.

The PANalytical support team had to negotiate century old marble tiles and priceless statues to get the system's 1 tonne weight across a glass floor and into a glass elevator before it could be installed.

The base unit of the X'Pert PRO being carefully manoeuvred in the entrance lobby

China User Club Meeting 2012

The 12th PANalytical China User Club Meeting held in Hangzhou on 18 & 19 September 2012 was a resounding success with a record turnout of more than 230 users from all across China.

The opening day of the meeting, 18 September 2012, coincided with PANalytical's 10th anniversary. China had the honor of being the first country outside the HQ to kick off the celebration. '10 years of PANalytical - the curiosity of youth with a century of experience' thus became the theme of the welcome address by Mr. Anant Bhide, General Manager APR region.

Dr. Peter van Velzen, Managing Director of PANalytical, impressed the audience with the latest innovations from PANalytical: the PIXcel^{3D} 2x2 detector and the Eagon 2, PANalytical's automatic fusion machine.

Several prominent Chinese professors from renowned universities and institutes delivered insightful lectures at the general assembly. Among them were Prof. Mai Zhenhong (Chairman of the China XRD Association), Prof. Luo Liqiang (VP of the National Geological Research Centre, and Prof. Zhuo Shangjun (Director of the Testing Centre, Shanghai Institute of Ceramics). Since the inaugural meeting in Shenzhen in September 1990, this biennial event has grown significantly in scope and size. The quantity and standard of the technical papers submitted to the organising committee has also risen over the years. This year 6 XRD and 5 XRF papers were selected from a total of 57 papers to win the prestigious PANalytical Paper Award.

PANalytical China was proud to be able to celebrate the installation of the 500th Axios at the Shiheng Special Steel Group last year. To commemorate this milestone achievement, the user was awarded with a special maintenance contract.

Prof. Mai Zhenhong

The meeting has once again succeeded in strengthening the ties between PANalytical and the users of its systems by learning from each other during the two days of lectures and workshops.

PANalytical

Events calendar 2013 - Q1

You will find us at the following events during the upcoming period. If you attend any of these events, please pass by and visit us!

Date	Event	Location
January 23 - 25	GEO India	New Delhi, India
January 29 - 31	Thermoplastic Concentrates 2013	Coral Springs, FL, USA
February 14 -16	International Conference on Material Science (ICMS 2013)	Tripura, India
February 17 - 20	Louisiana Transportation Conference	Baton Rouge, LA, USA
March 17 - 19	Annual Meeting of the Ceramics Society of Japan	Tokyo, Japan
March 17 - 21	Pittcon 2013	Philadelphia, PA, USA
March 18 - 20	Building Materials Analysis conference 2013	Halle, Germany
March 27 - 30	Spring Conference of the Japan Society of Applied Physics	Kanegawa, Japan

Please visit www.panalytical.com/events for more information.

Building Materials Analysis (BMA) conference 2013

The next Building Materials Analysis (BMA) conference will be held from 18-20 March 2013. The workshop, which is held every other year, is organized for the fifth time by PANalytical in cooperation with the Mineralogical/Geochemical Institute of the University of Halle / Saale (Germany) and will take place at the University of Halle (Germany).

The main focus will be on X-ray methods (with special emphasis on the use of the methods for clinker and cement production and quality control). Also alternative analytical methods for building materials analysis will be covered, including on-line analysis, sample preparation and characterization, analysis of special cements and hydration studies. Sustainability, CO_2 reduction and alternative raw materials will be other main topics.

The workshop is intended for professionals and graduate scientists and engineers working in the cement industry, as well as for researchers from universities working on building material topics.

The bridge from classical to innovative analysis methods

Find out more by scanning the QR - code

www.panalytical.com/BMA2013

Colophon

PANalytical B.V.
Corporate Marketing and Communications Department
Lelyweg 1, 7602 EA
PO Box 13, 7600 AA
Almelo
The Netherlands
T +31 (0) 546 534 386
F +31 (0) 546 534 598
info@panalytical.com
www.panalytical.com

Please send your contributions, suggestions and comments to the above address.

Regional sales offices
Americas
T +1 508 647 1100
F +1 508 647 1115

Europe, Middle East, Africa
T +31 546 834 444
F +31 546 834 499

Asia Pacific
T +65 6741 2868
F +65 6741 2166

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