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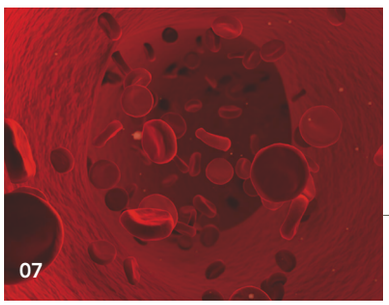

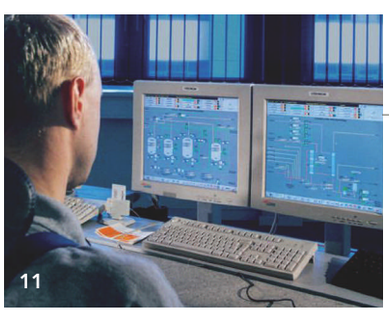

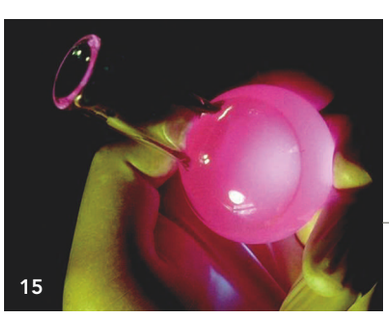

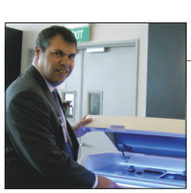

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Editor's Note

Michael Tham
Editor

Asia: Advancing in the Face of Adversity

Pharmaceutical companies appear to have their sights set on Asia. The first couple of months in 2009 has seen the likes of Millipore, Schering-Plough and PerkinElmer opening up their training or research facility in Singapore.

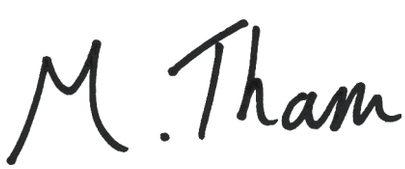
In this issue, we feature an exclusive interview with Rob Nail, GM, Agilent Automation Solutions, who is in the process of setting up a production facility in Singapore (page 23). The plant will focus on developing equipment and technology for life science laboratories. Despite the global economic slowdown, he is expecting double digit growth from his business unit in Asia Pacific this year.

The Technology Vision Group is also stepping up its efforts in two of Asia's major life science markets – China and India. The company's BioPartnering initiatives are geared towards matchmaking foreign life science companies with their counterparts in these countries.

There is currently rising concern from overseas markets on the authenticity, safety and quality aspects of imported drugs from Asia. Audit service provider, blue inspection body is conducting third-party audits of excipient and active pharmaceutical ingredient (API) manufacturers in Asia. It is offering manufacturing authorization holders in Europe the opportunity to take part in the audits to qualify their suppliers from India and China.

Consumers will be able to play a part in combating the proliferation of fake drugs. Zuellig Pharma has unveiled a facility in Singapore that will focus on the development of anti-counterfeit solutions. The company is planning to roll-out a technology that can be used by anyone with a mobile phone. This allows consumers who buy a pharmaceutical product to send out a text message containing the serial number and receive immediate authentication on the product.

Even in the face of a global economic downturn, major players in the pharmaceuticals arena seem to be going against the grain, with the execution of their expansion plans. Perhaps Dr Daniel Marshak, vice president, PerkinElmer sums it up all too well, "We want to use the opportunity to build customer relationships and release new products, and be able to position ourselves to move forward when the global economy starts to recover." **PA**



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Global News

Breakthrough Vaccine for West Nile Virus

Scientists are a step closer to a breakthrough vaccine for the potentially fatal West Nile Virus, and say this gives a "green light" to developing a similar vaccine for Dengue Fever.

Chief Executive Officer of Brisbane-based biotechnology company Acuvax, Dr William Ardrey, said its American affiliate company, Hawaii Biotech had posted successful results in phase one trials of the West Nile Virus vaccine.

The West Nile Virus study checked for the safety and antibody development in 24 patients. None of them involved suffered any serious side effects. "In this case, 100 percent of patients responded as we wanted them to," Dr Ardrey said.

The West Nile Virus vaccine will now be tested on children, the elderly and immuno-compromised patients. Dr Ardrey said that if phase two and three trials produced similar results, the West Nile Virus. **PA**

Esco: White Papers on Decontamination

Esco has announced the publication of white papers documenting hydrogen peroxide vapor decontamination of its biological safety cabinets.

Steris Corporation and Bioquell are vendors of hydrogen peroxide vapor generators. These papers explore the process using both companies' equipment to decontaminate biological safety cabinets, documenting:

- Procedures for hydrogen peroxide vapor decontamination
- Cycle parameters
- Microbiological efficacy
- Material compatability **PA**

The Netherlands Spurs Growth in Pharmaceuticals

Approximately €750 million (US$1.2 billion) is being set aside by the Dutch government, academia, and private companies to help three Dutch companies organize partnership platforms over the next five years aimed at innovating in the areas of pharmaceuticals, biomedical materials, and diagnostics. Another €310 million in public-private finance is being channeled into exploratory research schemes.

The three organizations are Top Institute (TI) Pharma for pharmaceuticals, BioMedical Materials for materials, and the Center for Translational Molecular Medicine (CTMM) for diagnostics.

One initiative is the creation of a Life Sciences & Gezondheid, or Health, (LSG) program, backed by the government and industry. LSG aims to play a key role in enabling the Netherlands to double over the next 10 years, the size of its life-sciences sector. This sector currently employs 55,000 people and brings in €16 billion accounting for three percent of the country's gross domestic product.

The program will help small and medium-sized companies, which comprise most of the 935 companies in the Dutch life-sciences sector, to bridge the investment gap between basic research and later-stage development once investors are willing to provide support. **PA**

Sigma-Aldrich Introduces shRNA Libraries

Sigma-Aldrich has announced the global release of the Mission LentiPlex Pooled Human and Murine short hairpin ribonucleic acid (shRNA) libraries. Using the shRNA collections of The RNA interference (RNAi) Consortium (TRC), the libraries enable genome-wide RNAi screening at the bench-top level in a pooled lentiviral format.

The libraries were developed from the entire TRC-1 human and mouse collections of more than 158,000 shRNA constructs, targeting approximately 16,000 human genes and 16,000 mouse genes. Combining the company's lentiviral production methodologies with the pooled library format enables researchers to perform genome-wide RNAi screens on various cell types to discover new targets without a large investment in infrastructure.

LentiPlex enables researchers to screen for novel phenotypes in relevant cell lines and to study gene function and disease. This applies to both standard cell lines and difficult cell types such as primary, non-dividing, growth-arrested or terminally differentiated cells that are typically resistant to standard siRNA transfection or other viral delivery systems. **PA**

American Peptide Company Announces Expansion

American Peptide Company has announced the expansion of its peptide manufacturing facility in California, US. This two-phase expansion encompasses the construction of peptide purification and peptide synthesis suites. Four additional purification suites will be completed in the first phase and will commence operation in April 2009. This addition will include new high performance liquid chromatography (HPLC) columns and tray lyophilizers.

The second phase of the construction includes two additional large-scale synthesis suites for both solution and solid phase, and completion is forecasted for Q2 in 2009. **PA**

Thermo Fisher and TTL to Distribute Rheometers in India

Thermo Fisher Scientific has signed an agreement with TTL Technologies to distribute the former's rheometers and viscometers in India. In addition to the former's direct sales and service offices in Mumbai, Pune, Chennai and Delhi, TTL's subsidiaries across the country will help to support Indian customers.

TTL is our distributor for rheometers and viscometers in India, catering exclusively to academic and government institutes as well as specific markets and will complement our direct sales activities in this market," says Markus Schreyer, vice president and GM of Thermo Fisher Scientific's Material Characterization business unit. **PA**

Source: India PRwire

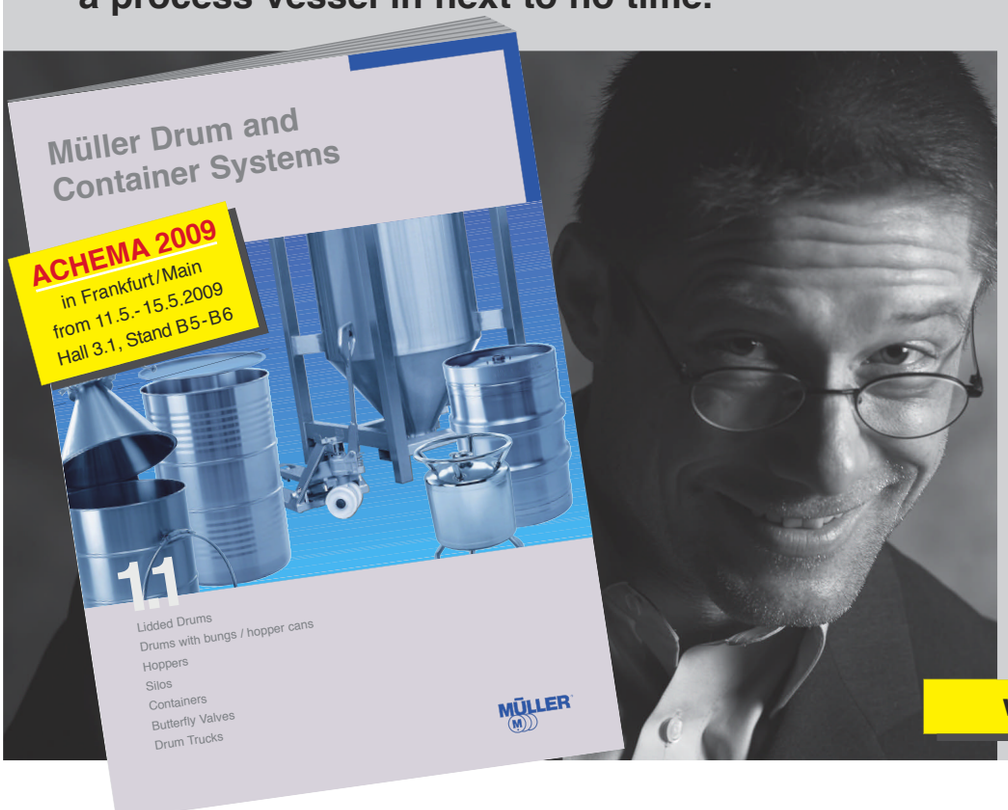
BioPartnering @ BangaloreBio 2009 Launched

Technology Vision Group (TVG), and MM Activ have announced a joint collaboration to enable foreign life science companies to expand into India. This initiative is called "BioPartnering @ BangaloreBio 2009" and is aimed at facilitating foreign life science companies to meet their Indian counterparts. The conference is due to take place in Bangalore, India from June 18-20, 2009.

TVG's partnering tool, biopartnering.com, will be available to delegates to organize one-to-one meetings at BangaloreBio.

India is one of the world's most important emerging centers of innovation. The biotechnology and pharmaceuticals sector in India is expected to become the fourth largest pharmaceuticals industry in the world in 2009. In 2008, Indian biotech was a US$2 billion industry, with goals of achieving US$40 billion in revenues by 2015. **PA**

On pages 2 to 31 we show how you can turn a storage and shipping drum into a process vessel in next to no time.



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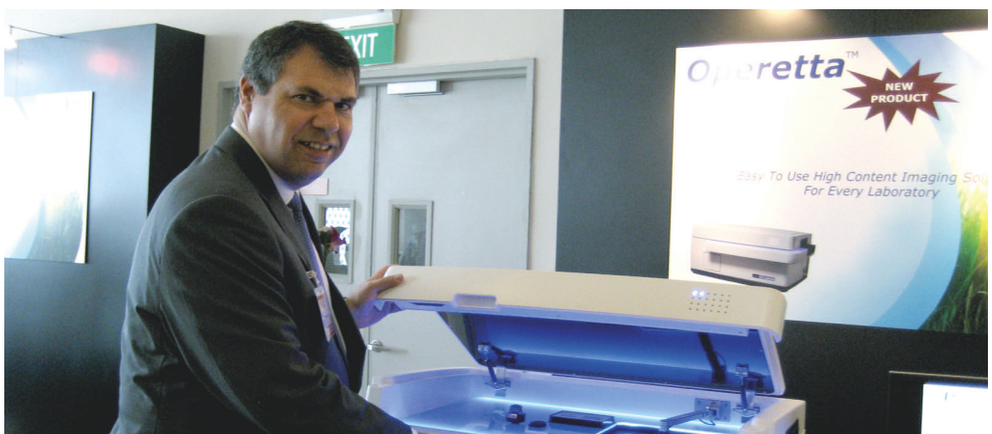
PerkinElmer Opens R&D Facility in Singapore

PerkinElmer has opened its Center of Excellence in Singapore. The center serves as a base for the company's R&D efforts in Asia, and will focus on the development of precision instrumentation and chemistries for a range of scientific and industrial laboratory applications, including drug discovery and development.

"The opening of the center in Singapore builds on our efforts to make long-term investments in Asia-Pacific to support the expansion of the health and environmental infrastructures of nations throughout the region," says Dr Daniel Marshak, vice president and chief scientific officer.

"It is not our intention to withdraw from the marketplace during the global economic crisis, but to use the opportunity to build customer relationships and release new products. We want to be able to position ourselves to move forward when the global economy starts to recover," says Dr Marshak.

"This investment will enable us to leverage in-country expertise and resources to drive the development of solutions to meet the changing needs of our local and global customers. The center provides a platform for PerkinElmer to work with public research centers and global biopharmaceutical companies to develop tools and applications to support the biomedical sciences research in Singapore," says Aw Kah Peng, assistant managing director, Singapore Economic Development Board.



Dr Daniel Marshak, vice president and chief scientific officer, believes that the global economic downturn presents an opportunity for the company to strengthen its customer relationships.

"The products that will be researched and developed here in Singapore will impact every aspect of our lives, from systems to test the safety of the water we drink and the quality of the air we breathe, to technology that may help to identify a new medication to cure a disease," said Dr Richard Begley, president, Analytical Sciences, PerkinElmer.

According to Dr Marshak, "We have made a commitment in developing imaging technologies such as standard microscopy, high-throughput screening and high content screening. We see software and information technology as an integral part of imaging."

"A lot of cellular image analyses are focused on algorithms used to interpret what the scientist sees. For example, scientists study neurons from the brain to determine whether the neural processes branch out and make connections that are representative of growth and function. It is possible to use the algorithms that we supply to automatically look at the image and have the computer scan and count the number of branches, extensions and connections," continues Dr Marshak.

Asia represents a key growth region for the company, with growth opportunities in areas such as pharmaceutical research, neonatal and prenatal screening, and environmental monitoring. **PA**

BioSingapore Announces Winners for Asia Pacific Biotechnology Awards

BioSingapore has announced the five most innovative and successful companies in the biotechnology field in Asia Pacific, as well as the Woman Entrepreneur of the year. The 2009 BioSingapore Asia Pacific Biotechnology Awards were given out during BioMedical Asia 2009. These awards recognize the winners' accomplishments made in the life sciences industry, and for the significant contributions they have made in advancing the sector in the Asia-Pacific region.

The winners of the six categories are:

1. Most Innovative Start-Up – Siogen Biotech, Malaysia
2. Best Listed Company – Biocon Limited, India
3. Most Successful Bio-Partnership – S*BIO, Singapore
4. Most Important Technology Development – XCyton Diagnostics, India
5. Best Performing CRO – PAREXEL APEX International Co, Taiwan
6. Woman Entrepreneur of the Year – Dr Deborah Rathjen, Bionomics, Australia

"The awards exemplify the growing economic impact and success of the biomedical industry, not only here in Singapore but throughout the Asia-Pacific region, and the importance of the close collaboration between the regional biotechnology organizations working together in the BioNetwork Asia-Pacific (BNAP)," said Prof Sir David Lane, chairman, Biomedical Research Council (BMRC), Singapore.

Every year, BioSingapore receives nominations from biotechnology industry associations, industry peers, academics and institutions across Asia Pacific for the most outstanding companies or individuals in various categories.

The nominees are judged by a panel of distinguished leaders in the field. This year, the judging panel consisted of Dr Anna Lavelle, CEO and executive director, AusBiotech; Dr Shrikumar Suryanarayan, director general, Association of Biotechnology-Led Enterprises of India; Dr Jonghoon Choi, secretary general, Korea Biotechnology Industry Organisation; and Dr Michael Entzeroth. **PA**

Pharmacogenomics: Bringing Hope

Shenglan Cao, PhD,
Technical Specialist,
Life Science Division, Sigma-Aldrich

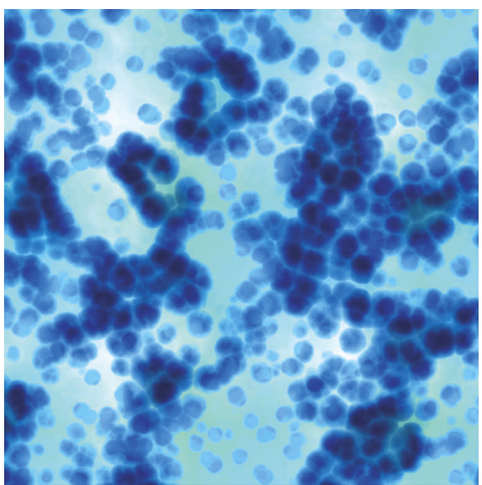
Pharmacogenomics can speed up the drug discovery and development processes, paving the way for further advancements in personalized medicine. Other benefits include a reduction in adverse drug reactions (ADR) and improved screening techniques for diseases.

Pharmacogenomic research provides an understanding of the correlation between genetic factors. It serves to explain how these factors affect responses to treatment, and identifies new targets for prospective treatments. Minor differences in an individual's genetic makeup, such as variations resulting from single nucleotide polymorphism (SNP), may potentially enhance or diminish the efficacy of a given medication or vary its side effects.

An individual's unique response to a medication may be due to variations in the drug target itself or in genetic variations pertaining to absorption, distribution, metabolism and excretion. Figure 1 illustrates how the treatment outcome can be determined by genetic variations in the drug target/target pathway, or drug-metabolizing pathway. Pharmacogenomic studies encompass both of these potential treatment determinants.

Determining Appropriate Drug Dosages

Variations among individual hereditary genetic profiles may alter the rate of drug metabolism, resulting in differential therapeutic effects and toxicity levels for patients receiving the same dosage of medicine. According to *Implementation of Genetics to Personalize Medicine, Gender Medicine Vol 4, No 3, 2007*, these variations are common within the population and affect the majority of patients taking medication. For example, 20 to 40 percent of patients do not respond to medications commonly prescribed for hypertension, depression, coagulation, and diabetes. Potentially, genotyping can be used to assist in preventing the adverse effects of a medication and to enable the timely administration of effective treatment.



(Source: Sigma Lifescience)

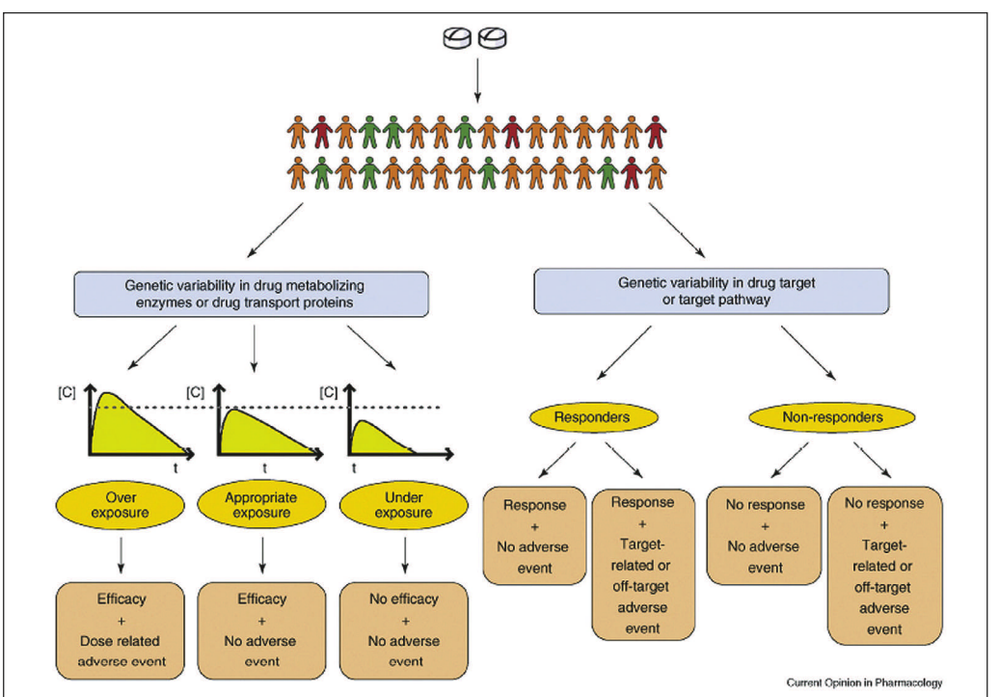


Figure 1: A schematic overview of genetic variability affecting drug response and disposition. [C] is the drug concentration and t is time. (Source: Bhathena A and Spear B, *Current Opinion in Pharmacology 2008*)

Through scientific research, the connection between a variation in a given gene and the subsequent change in drug metabolism and drug action, enables medical practitioners to prescribe suitable medications more accurately while tailoring dosages to each individual. This process is a favorable alternative to the current method of trial and error.

Improvements in Drug Discovery and Approval

Pharmacogenomics plays an important role throughout the development of biotherapeutics, from target identification through clinic trials, followed by patient care. In addition to speeding up drug discovery, it can aid in increasing therapeutic efficacy while decreasing the risks of toxicity.

Pharmaceutical companies can use pharmacogenomics to identify new drug targets and to

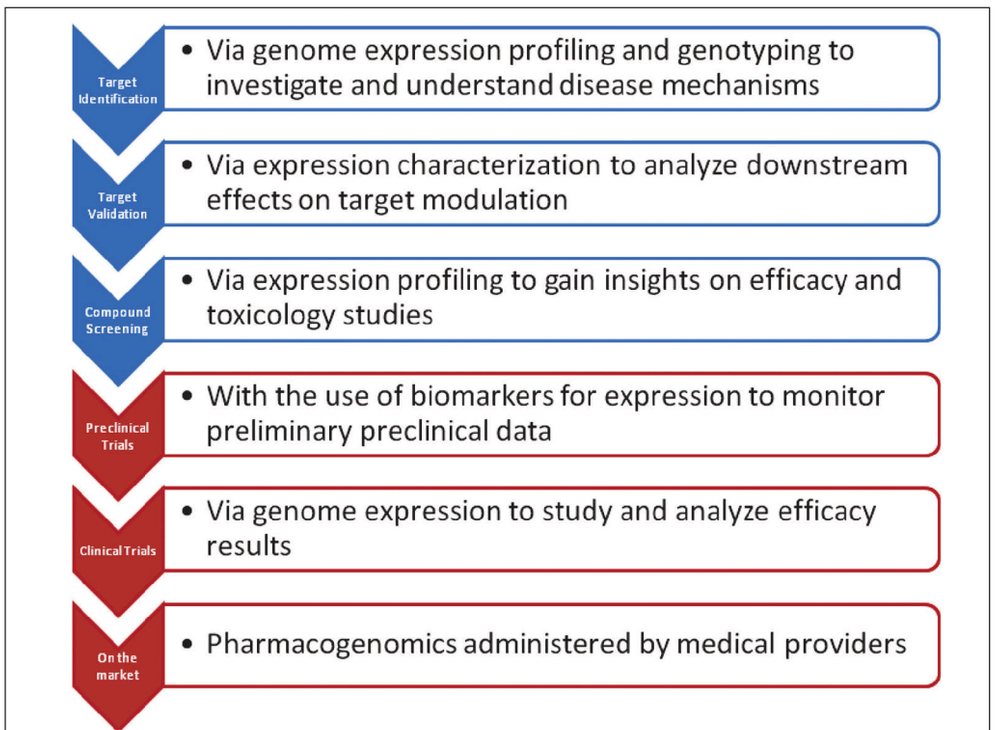


Figure 2: The flow chart of the application of pharmacogenomics in drug discovery. (Source: Sigma LifeScience)

create drugs based on the proteins, enzymes, and RNA molecules associated with specific genes and diseases. Since drug efficacy is influenced by genetic variation, drug discovery now includes pharmacogenomic screens to identify common genetic polymorphisms as part of the drug development process. This provides pharmaceutical companies with the potential to develop therapeutics that target populations which have specific genetic profiles.

As the development of a potential drug moves into the clinical trial stages, earlier work from pre-clinical stages can be used to help identify trial participants. Simple molecular diagnostic genotyping assays have been used to qualify participants for trials. The cost and risk of clinical trials can be reduced by only selecting the participants with genotypes that are likely to respond positively to the drug.

The process of obtaining regulatory approval should also be simplified as tailored drugs are targeted towards a specific genetic population, providing a higher rate of success. Finally, it is possible that failed drug candidates may be revived as they can be matched to a more niche-specific population.

Pharmacogenomics analysis may reduce adverse drug events/reactions (ADR). In the US, it is estimated that ADR affects more than 2.2 million patients and kills about 100,000 people each year, making it one of the leading causes of hospitalization deaths today. Additionally, ADR is a principal reason why drugs may be withdrawn from the market, causing financial losses in the pharmaceutical industry. It is possible however, through pharmacogenomics, to identify the genes responsible for ADRs and subsequently limit prescriptions to individuals with the genotypes that will tolerate the drug.

Advanced Screening for Disease

Population-based genetic screening can identify markers and provide an opportunity for improved health outcomes through preventive medicine. Population stratification refers to differences in allele frequencies due to systematic differences in ancestry. Screening can facilitate population stratification and identify individuals who are at increased risk to various diseases. These individuals are likely to benefit from preventive medications, while the increased awareness of their susceptibility to a disease could provide the motivation to comply with recommended changes in lifestyle. For example, exercise and weight control for individuals with a higher risk of diabetes; and smoking cessation for those who are susceptible to lung cancer.

Decrease in Health Care Costs

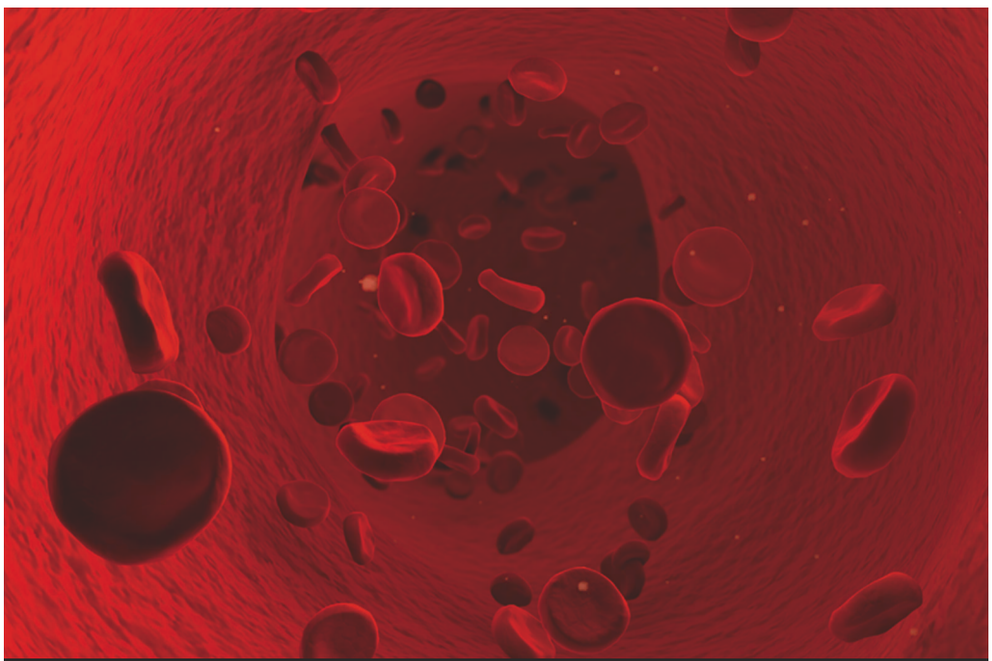
In many clinical programs, patients with a diverse genetic composition are recruited to address inter-patient variability. However, even with the large sample sizes in current trials, the characterization of rare ADR (less than 1 in 1,000) presents a major challenge. The current solution is to perform extensive safety testing on large and heterogeneous populations prior to market approval. This significantly increases the time and cost of clinical evaluation, which creates a barrier to drug development.

An alternative solution may be found in the use of pharmacogenomics not only as a tool to develop medicines but also to enhance current drug-surveillance strategies. This surveillance approach would allow high volume, high quality, safe and accurate genetic/medical data to be gathered from several hundred thousand patients, instead of only those evaluated in post-marketing clinical trials or by voluntary reporting mechanisms. The implementation of this strategy requires the collection and storage of blood samples from each patient. This allows DNA to be extracted from a sample which corresponds to a patient who experiences ADR, to be compared with the DNA from patients who do not demonstrate any ADR.

Pharmacogenomics for Personalized Medicine

The completion of the Human Genome Project was a major milestone ushering in the era of genomics. Human gene sequence information provides avenues for the development of personalized medicine. Pharmacogenomics is fundamental to personalized medicine strategies and holds the key to drugs that may one day be customized for one's specific genetic makeup. The FDA defines pharmacogenomics as "The study of variations of deoxyribonucleic acid (DNA) and riboNucleic acid (RNA) characteristics as related to drug response" or simply put, how an individual's genetic inheritance influences the body's response to drugs.

Environmental, dietary, age, lifestyle and state of health factors can all influence an individual's response to medicines. Pharmacogenomics is expected to improve positive patient outcomes by increasing the understanding of the genetic basis for both the disease and the response to treatment. Therefore, the potential benefits resulting from the study of pharmacogenomics range from a reduction in ADR and the cost of treatment, to improving the overall pharmaceutical development workflow.



Pharmacogenomics serves to enhance current drug-surveillance strategies, which require the collection and storage of blood samples from patients. (Source: Sigma Lifescience)

Testing for Genetic Variation

Despite these benefits, the application of pharmacogenomics is still in its infancy. There are several applications where pharmacogenomics currently plays a role. Two of these applications are exemplified via the cytochrome P450 (CYP). This family of liver enzymes is responsible for breaking down more than 30 different classes of drugs. DNA variations in the genetic code for these enzymes can influence a person's ability to metabolize certain drugs. The less active forms of CYP enzymes are unable to break down and aid in the efficient purging of drugs from the body. This may result in a drug overdose in patients.

Genetic tests for the detection of variations in cytochrome P450 genes are now commercially available. One such test (AmpliChip CYP450 test, Roche Diagnostics) offers the ability to genotype 29 polymorphisms, mutations, deletions, and duplications for cytochrome P450 2D6 (CYP2D6); and two polymorphisms for CYP2C19. CYP2D6 and CYP2C19 are responsible for the metabolism of approximately 25 percent of drugs, such as tricyclic antidepressants, proton pump inhibitors and benzodiazepines.

Information from the 31 assays are integrated to produce a simple interpretation, classifying a patient's predicted metabolism as poor, intermediate, extensive, or ultra rapid. Package inserts for selected medicines may contain dosage information specific to the predicted metabolizing phenotype.

CYP enzymes also play a role in coagulation therapy. The administration of anticoagulants is a challenging therapy that has been made easier and safer by implementing a pharmacogenomic approach. Deriving the accurate dosage is critical for anti-coagulants to be effective. An insufficient dosage may deem the anti-coagulant ineffective for thrombophilia treatment, while an overdose may result in adverse effects such as bleeding.

In the process of adjusting the dosage of Warfarin, approximately 29,000 patients are expected to suffer from bleeding complications that may require emergency room visits. Pharmacogenomic tests are now available for both the Warfarin-metabolizing gene CYP2C9 and the target vitamin K receptor VKORC1. In conjunction with other known variables such as age, gender, weight, ethnicity, diabetes and smoking status, pharmacogenomic assays help in the selection of a suitable initial dose and in reducing the length of time required to achieve optimum therapeutic results.

The detection of thiopurine methyltransferase (TPMT) in the patients to assist in the treatment of childhood leukemia is another example of a pharmacogenomic application. TPMT plays an important role in the chemotherapy treatment for common childhood leukemia. It breaks down a class of therapeutic compounds called thiopurines. A small percentage of Caucasians have genetic variants that prevent them from producing an active form of this protein.

As a result, the thiopurines become elevated to toxic levels in such patients because the inactive form of TMPT is unable to break down the drug. By using a genetic test to screen patients for such a deficiency, the TMPT activity in the patients can be monitored. This then allows the appropriate thiopurine dosage levels to be administered based on the TMPT activity.

Barriers to Development

A primary barrier to the progress of pharmacogenomics is the complexity affiliated with correlating a specific gene variation to a specific drug response. SNPs occur once every 100 to 300 bases along the three-billion-base human genome. Millions of SNPs must therefore be identified and analyzed to determine their involvement in drug response. Furthermore, copy number variations in the human genome are an additional source of gene variability, and these insertions, deletions, and duplications have been reported to affect 12 percent or more of the human genome. A further barrier is in identifying and confirming which genes are involved in the drug response.

Since the various genes are likely to influence drug response, the task of understanding the impact that each gene variation has on the response can be daunting.

Current practices utilize a one-size-fits-all philosophy for drug prescription or at best, a trial and error approach to medicine. Moving away from this method towards the approach of matching patients with the individualized drugs by using pharmacogenomics is essential. However, for pharmacogenomics to become an established medical technology, health practitioners will need to have an understanding of the field of pharmacogenomics and be able to interpret pharmacogenomic test results to prescribe the appropriate drugs at appropriate doses.

Confidentiality Issues

To be successful at implementing a pharmacogenomics methodology, the healthcare industry needs to address patient concerns. Foremost among these is the issue of confidentiality and the potential misuse of personal genotype data. If appropriate protection measures are not implemented, public concern may become an obstacle to data collection. Implementation of a pharmacogenomics-based drug discovery approach to medicine will require large-scale genotyping of populations.

This data set presents serious implications for the pharmaceutical industry, regulatory bodies, health professionals and patients. As with any medical intervention, breaching confidentiality with respect to pharmacogenomic test results

could lead to discrimination by third parties, such as insurance providers and employers.

Changing the Business Model

Pharmacogenomics offers significant advantages to drug development and commercialization. However, the segregation of patient populations could potentially limit the revenue per therapeutic approval. It costs several hundred million dollars to bring a single drug to market. Incurring such costs by introducing multiple variations of a drug to serve only small segment of the population is not financially viable. The current one-size-fits-all financial model to drug development will need to give way to a model where a pharmacogenomics approach will be fiscally motivated.

Future Needs

Pharmacogenomics is expected to provide one of the solutions to overcome the drug development barriers of toxicity and drug response. The pharmaceutical industry seems to be using pharmacogenomics increasingly for both drug selection and proper dosage determination. Molecular diagnostics and other polymerase chain reaction (PCR)-based techniques coupled with the ability to provide global views on genome sequence and gene activity, have emerged as key analytical tools in the field of pharmacogenomics. Vast amounts of data need to be collected and analyzed to meet pharmacogenomics' goals, ranging from identifying markers that predict individuals' responses to therapy, to discovering new drug targets. The mentioned techniques are likely to be instrumental to these efforts as they provide various sources of gene expression and genotypic data.

While the goal of personalized medicine may still take decades to materialize, the techniques that make up pharmacogenomics continue to drive this progress. In the near future, it may be possible to determine the susceptibility of individuals to disease, and the specific pharmacologic and lifestyle-based precautions that can be taken to intervene effectively. These processes can be performed in real time and at different stages in the life of individuals.

Using pharmacogenomics to rationally select appropriate medications with the correct dosage may help to prevent or treat disease more efficiently, with fewer adverse outcomes. The future of the pharmacogenomic approach to drug discovery relies on researchers to use gene manipulation technologies to better understand and/or modulate gene function as it pertains to drug treatment. **PA**

Gene-Editing Tools for Research

Several gene-editing tools with the potential to facilitate pharmacogenomics research have been introduced. Advancements in gene editing and RNA interference (RNAi) technologies provide the critical tools required for the study of gene functions, the exploration of disease development mechanisms, and the identification of drug targets.

As Dr Edward Weinstein, director of Sigma-Aldrich Transgenics postulates, "When personalized medicine is thought of as a means of subdividing patients suffering from a common disease into populations of 'responders' and 'non-responders' to a certain treatment, rather than the tailoring of drugs to individuals, we can say that we are on the brink of significant breakthroughs in this field. The RNAi Consortium (TRC) library is a pharmacogenomics tool that can be integrated into both basic R&D and pre-clinical studies. It provides a significant enhancement in the understanding of the mechanisms of both candidate drugs and established therapeutics."

The application of RNAi technologies in pharmacogenomics substantially speeds up the process of pharmacogenomics development. The short hairpin RNA (shRNA) libraries are developed by the RNAi Consortium (TRC), which is a public-private effort based at the Broad Institute. The mission of the Broad Institute is to create a shRNA library as well to validate tools and methods that will enable the scientific community to use RNAi to determine the function of human and mouse genes. In addition to traditional RNAi technologies, zinc finger nuclease (ZFN) technology has recently been commercialized. ZFNs are a class of engineered DNA-binding proteins that facilitate the targeted editing of the genome by creating double-strand breaks in DNA at user-specified locations.

ZFNs consist of an N-terminal zinc finger DNA-binding domain, a variable peptide linker and a C-terminal endonuclease domain. By introducing a break at a desired location, ZFNs can be used to insert or delete a gene from the human genome, or be used to modify gene expression patterns. Current expectations are that the field of gene manipulation and gene editing will advance the field of pharmacogenomics.

Pharmacogenomics enables medical practitioners to prescribe suitable medications more accurately while tailoring dosages to each individual. (Source: Sigma Lifescience)

The Right Mix

Eugene Yeo,
Director,
Pharmaceutical Industry South East Asia,
Siemens

The driving force behind an effective plant management system depends on the proper integration of human resources, regulations and sound business strategies.

A Plant Management System (PMS) might sound just like another tool – a computer system that that is used to control, operate and manage a plant. In reality, a complete system is more than that. It should take into consideration the people behind the design of the system and those who operate it.

The people element is one of the most important aspects of a PMS. It provides the knowledge and the management skills to design, build and use the system.

This operational vision for the design of a PMS is built on the foundation of equipment and technologies that make up the:

- Physical plant
- Mechanical system
- Electrical system
- Automation system
- IT system

These components provide relevant information and collectively form the PMS. When these elements are optimally put together and coordinated according to user requirements, the result is a cost-effective and efficient system.

Leveraging on Technology

The pharmaceutical industry is undergoing a process of transformation. Increasing price pressures, diminishing income levels and rising R&D costs are forcing pharmaceutical companies to rethink their strategies and business models. Yet alongside these challenges also lie opportunities. Regulatory frameworks are encouraging new ways of working so that the industry can respond to the challenges. Guidelines and innovative technologies are enabling the pharmaceutical industry to prepare for a future of change and growth.

A paradigm shift is taking place in the regulations of the US Food and Drug Administration (FDA). This is enabling the pharmaceutical industry to profit from the progress made in various areas of information technology and automation systems. A major aspect of FDA guidance is to address the need to understand production processes better. The aim is to apply detailed knowledge of the processes to determine product quality faster while controlling it more effectively.

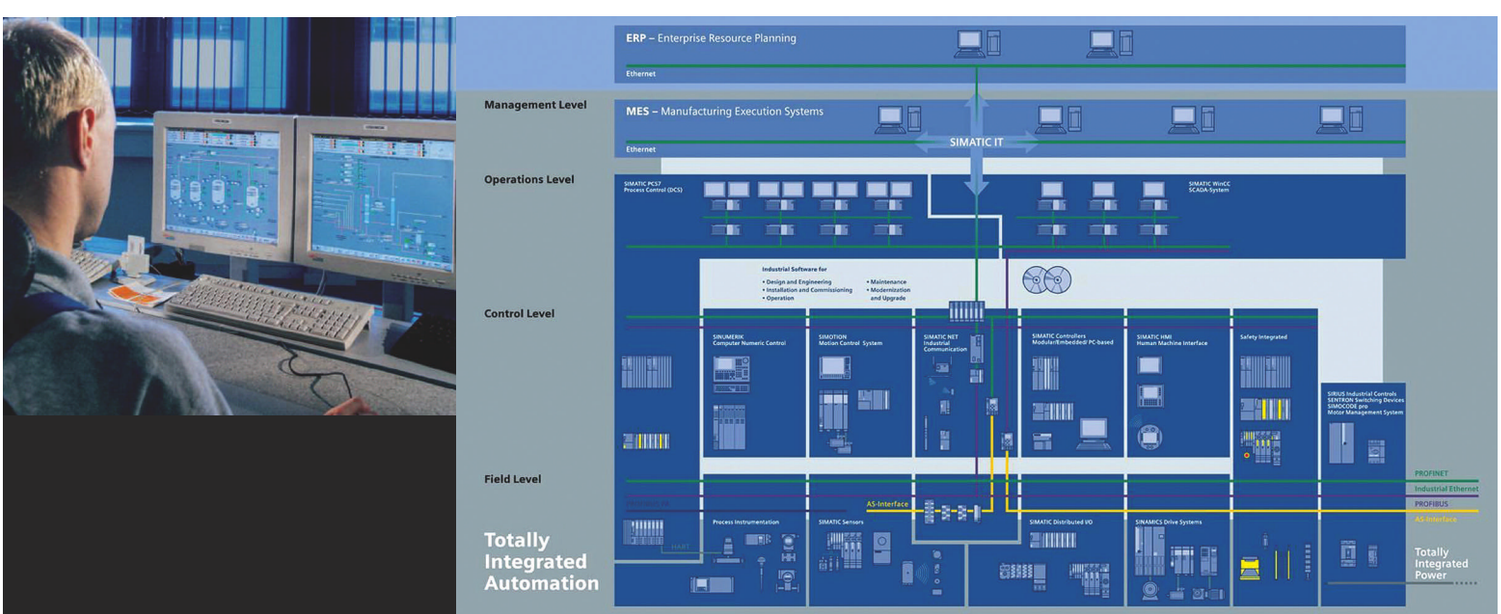
In its current Good Manufacturing Practice (cGMP) guidelines, the FDA issues a direct call to action. In particular, the sector is encouraged to utilize technological progress, implement a risk-based approach to quality assurance and integrate modern systems for the detection of quality parameters into its processes.

The 21 CFR Part 11 guidance is one component of these regulations. It describes the requirements for the use of electronic records and signatures in production documentation. Other guidelines, relating to issues such as Process Analytical Technology (PAT), have also been issued.

The goal of these regulations is to ensure the quality, safety and availability of medicinal drugs through the use of technology.

Integrated Automation

A PMS that integrates these aspects not only helps pharmaceutical manufacturers to meet



The integrated automation concept should include integrated diagnostic functions and asset management tools from the field level, up to the manufacturing execution level. (Source: Siemens)

Drug Manufacturing

the demands of the market and comply with the stipulations of government authorities, but also increases the productivity and safety of its processes.

An integrated automation concept enables companies to optimize various aspects of the pharmaceutical production chain, such as overall quality excellence, optimal asset valuation, supply chain excellence and manufacturing excellence.

• Overall quality excellence

With an integrated approach, manufacturers can embed quality assurance measures into their processes. A PMS that has the capability to connect to instruments for process analysis and evaluation, to solutions for process analysis and automation as well as advanced process control tools, will provide users with a better understanding of quality relevant factors in production.

These aspects of quality excellence can further stimulate the adoption of PAT. This technology forms part of the production and quality system that provides the real-time release of products.

Real-time product release can be explained by studying a manufacturing plant where a pharmaceutical product is produced through a series of production steps. At each designated step, a sample is collected and sent to the laboratory for quality tests. While the test is being conducted, which may take up to a week, the intermediate product has to be put on hold.

After the lab results return positive, the product is released for the next stage of processing. This may be done several times throughout the entire production process.

With PAT, quality checks can be performed while the product is being manufactured. When a process stage ends, the quality results will indicate if the intermediate product meets the standard to be immediately released to the next process step, allowing certain lab tests to be eliminated or minimized.

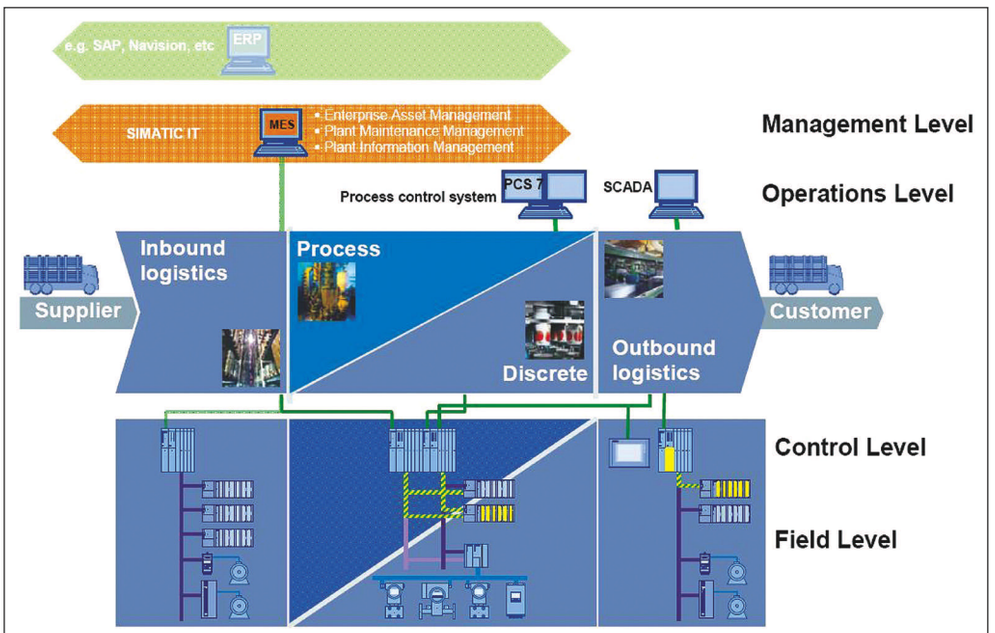
Overall quality excellence is made up of the following components:

- Quality by design
- Total quality management
- Right-first-time quality
- Real-time product release

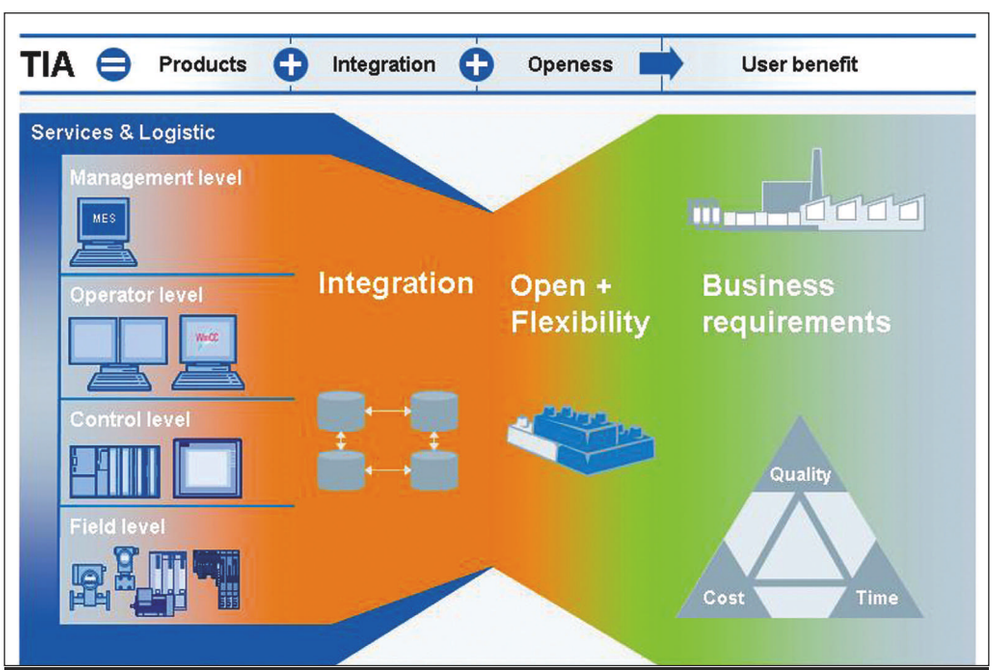
• Optimal asset valuation

The integrated automation concept allows a PMS to perform production planning while optimizing maintenance processes and making full use of plant resources. It should also include integrated diagnostic functions and asset management tools from the field level, up to the manufacturing execution level. Manufacturing flexibility is also enhanced with adaptable recipe-controlled processes and production management. Optimal asset valuation comprises of:

- Maintenance
- Downtime management
- Maximizing operational efficiency
- Maximizing flexibility



A PMS should not only cover the entire supply chain but also provide solutions that link all processes and parts of the value chain. (Source: Siemens)



The Totally Integrated Automation (TIA) concept from Siemens requires vendors to place emphasis on openness, integration capability and scalability from the onset. (Source: Siemens)

• Supply chain excellence

A PMS should not only cover the entire supply chain but also provide solutions that link all processes and parts of the value chain. In this way, production can be adapted to actual market requirements better, more efficiently and, more flexibly. Moreover, this ensures the comprehensive traceability of all products and

processes along the entire value chain. Supply chain excellence comprises of the following components:

- Production logistics
- Warehouse integration
- Demand-driven supply network
- Collaborative manufacturing

- **Manufacturing excellence**

To ensure constant optimum productivity, processes and work steps must be matched to each other. Flexible in-line control and monitoring are also necessary features. An integrated PMS that has a broad portfolio of connectivity to other devices and a seamless integration solution, provides companies the ability to optimize all processes and manufacturing procedures. Manufacturing excellence encompasses the components of:

- Process know-how
- Plant availability
- Process reproducibility
- Operator convenience

Vendors that offer such capabilities in their PMS solution provide the convenience of a one stop shop for horizontal and vertical integration of the entire plant's processes. Horizontal integration ranges from the production of active ingredients to formula creation and the packaging line.

Vertical integration starts from field level to the control and operation levels, up to company management, using tailor-made manufacturing execution systems (MES). This helps companies to optimize processes and manufacturing procedures at the same time.

Consistent integration

PMS system suppliers and vendors should adopt the principle of consistent integration, which applies to products, systems, services and application know-how.

This principle will offer long-term benefits to companies in areas such as:

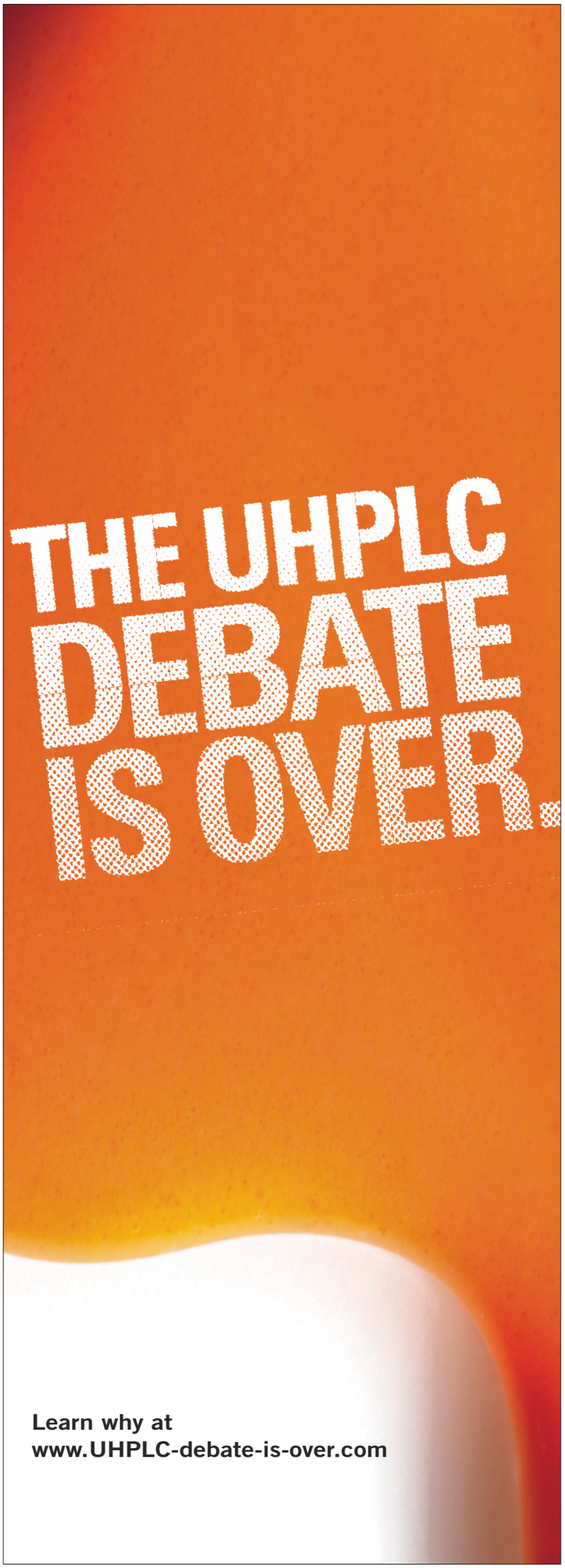
- A reduction in engineering expenditure and effort for the creation of automation solutions
- Optimized upscaling without gaps in the system – from the laboratory to production
- A reduction of the time-to-market
- Lower life-cycle costs
- Investment protection

Ideally, integration should be viewed as the perfect interaction of all system components and products. When developing related products and systems, vendors should place emphasis on openness, integration capability and scalability from the onset.

Within this framework, the pharmaceutical engineering community, suppliers, vendors, engineers and users should continuously strive to develop the comprehensive portfolio further. This is while constantly taking into account the requirements of the pharmaceutical industry, especially compliance with the FDA regulations.

A plant management system concept should be modular and scalable to suit the complexity of different plants and applications. Modularity allows for different functions to be fitted into the system according to application requirement without excessive customization and development time.

Scalability allows functionality to be expanded when plants increase



production capacity without affecting existing setup, especially in the pharmaceutical industry where validation is a regulatory requirement and a costly affair.

SCADA (Supervisory Control And Data Acquisition), DCS (Distributed Control System), MES (Manufacturing Execution System) and ERP (Enterprise Resource Planning) are components that can be part of a PMS.

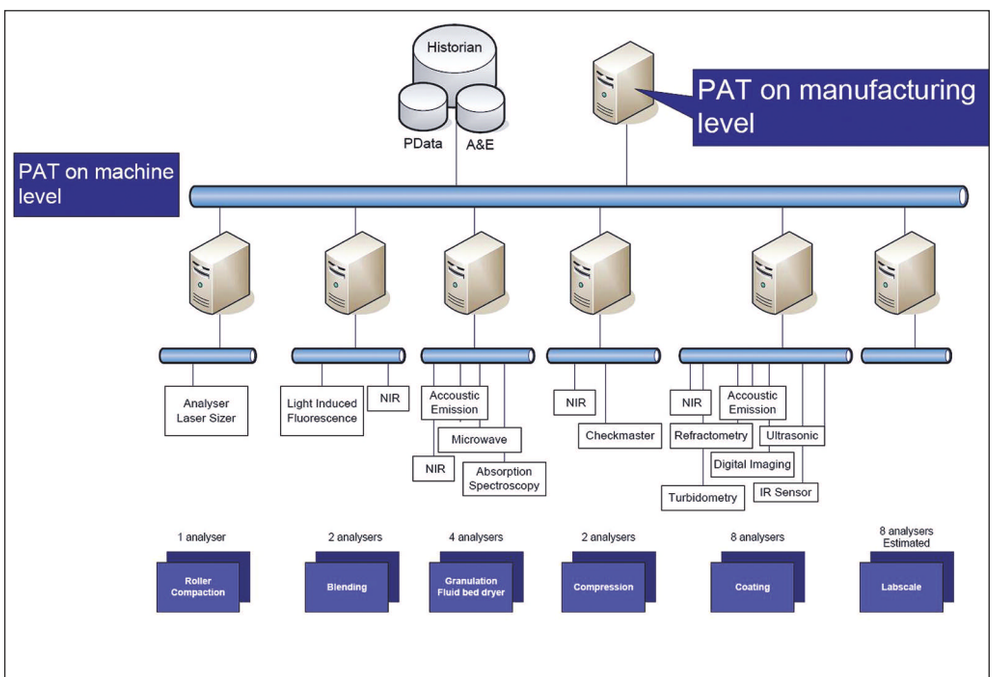
Centralizing Control Functions

A pharmaceutical plant can cover a wide geographic area, typically several hundred meters or kilometers, with multiple machineries, process and utilities systems running at the same time. The concept of a modern PMS will bring the key monitoring and controlling functions to a central point on one or a number of computer screens. It can also be distributed down to the plant floor or to several central process control areas. As a minimum requirement, it should provide the following functions:

- An interface to collect information to and from instruments, sensors and control elements (eg, pumps, motors, valves, temperature, pressure, flow devices)
- A central view of plant operations, eg, monitoring the progress of production processes and the operational state of the production plant and equipment
- Centralized control over the plant, eg, starting and stopping a process
- Alarms and warnings about the state of the plant, eg, turning on sirens if a process parameter such as temperature moves beyond the safety range
- Open communication to and from other electronic equipment and computers
- System access security and user management
- Data trending, logging and reporting features

Other common functionalities that can be added modularly include:

- Plant related reports (production reports, status reports, equipment reports, etc)
- Diagnostic information of the plant, eg, identifying the specific cause of a failure to an instrument or equipment (short-circuit, wire break or out of range measurement)
- Plant performance information, eg, overall equipment effectiveness (OEE), work in progress (WIP)
- Batch management software for batch plants
- Production scheduling and planning
- Laboratory information system
- PAT (process analytical technologies)



An example of Process Analytical Technology (PAT) architecture for pharma solid dose manufacturing (Source: Siemens)

Complying with cGMP

A plant management system needs to adhere to the stipulations of current Good Manufacturing Practice (cGMP). This refers to the requirements of 21 CFR part 11.

Access security – A PMS with an integrated logon feature has a central user management system with access controls in line with the validation requirements of 21 CFR Part 11. The administrator can divide users into groups and assign defined access rights (roles) to the latter. These specific rights are given to the operator when he/she logs on to the system.

Electronic signature – The signatures are combined with detailed records in the "changes" logbook to provide users with support for change verification.

Change control support, audit trails and electronic batch records – A PMS should create audit trails and store the electronic batch records. Changes to the application or system software are recorded and used to support change management – for example, by assigning version numbers.

Data storage and retrieval – Standard interfaces for archiving and data management make it possible to archive and retrieve batch records, audit trails and other important data.

Decision makers, users and implementers of PMS should be mindful of the different solutions that are available in the market. Attention should be given to PMS products that are forward looking, providing functionality relating to the pharmaceutical regulatory requirements of GMP, FDA 21 CFR part 11, S88 batch concepts, S95 standards for MES and even QbD/PAT requirements.

There should be a focus on concepts and practical solutions that have been designed, tested and proven for integration. It is important to weigh the strengths and weaknesses of various options in relation to application and business needs.

Ultimately, choosing technology partners that have the right business and financial strategies will help ensure that the PMS receives global support in terms of training, maintenance, improvements, modifications and future upgrading. **PA**

Bridging the Manufacturing Digital Divide

Jim Ricigliano,
Director Process Excellence,
Wyeth Pharmaceuticals;

Robert Honor,
Vice President,
Rockwell Automation

Information technology holds the key to an effective manufacturing strategy. Obstacles however, need to be overcome before benefits in productivity, consistency, and reliability can be reaped.

Major life sciences companies are adopting an enterprise-wide approach to their manufacturing information technology (IT) strategy. The importance of access to high-fidelity production information has evolved from a tactical "operations-only" perspective, to a strategic concern impacting regulatory compliance, competitiveness, and innovation capability on an enterprise-wide scale.

What are the inherent benefits, risks, and dependencies related to a strategy that demands convergence of skill sets and best-practices between two unlikely bedfellows – corporate IT and manufacturing operations/engineering?

Manufacturing IT Strategy

Collaboration, real-time, agility and visibility describe and dictate how production and business processes should work.

The speed of business, the pressures of globalization, and the expectations of customers, governments and partners are indicators that manufacturers may find it hard to survive without a coherent manufacturing IT strategy.

This convergence of manufacturing and IT can present opportunities, as well as challenges for organizations. The pharmaceutical industry's adoption of information technology at the production operations level, while still in the early stages, can be viewed as a relevant precursor by organizations seeking to achieve world-class performance.

Drug Manufacturing

(Source: Rockwell Automation)

In the pharmaceuticals industry, the original impetus took the form of regulatory pressure. Mandated compliance with government quality expectations has helped to drive the adoption of systems that increased the accuracy, reliability and speed of retrieving product genealogy for batch or assembly operations (EBR/DHR) as well as validating process rigor (CFR21 part 11).

Ironically, the same impetus for improvement in the industry may hinder additional advancements due to the validation costs associated with changes in production-related processes.

Nonetheless, the return on investment for a well-executed manufacturing IT strategy has been well-documented by independent sources. That is because digitizing manual and paper-based processes introduce enhanced consistency, visibility and reliability to production operations.

It results in the institutionalization of business rules and tribal knowledge. This is the equivalent to transforming the art of production into a science that can be measured, evaluated and consistently improved.

However, the transition of a workforce from paper batch records to electronic ones, involves training and change management. Conducting a basic computer skills assessment initially will go a long way in determining the computer readiness of the workforce, facilitating a follow up with the proper level of computer remediation training.

Payoff: Tactical or Strategic?

Demonstrating consistent process control has been a challenge laid down by regulatory organizations for pharmaceutical manufacturing sites. Erratic processes working within broad limits always raised the eyebrows of inspectors. Traditionally speaking, it was not unusual for certain process operators to manufacture specific problematic batches better than other operators.

Codifying that operator's experiences as best practices within a software application establishes another level of reliability. The ability to view system-generated control charts that show processes working comfortably within prescribed operating limits adds another level of consistency.

Process consistency also has a direct impact on production cycle-time. Paper-based processes are often riddled with batch record errors, causing manufacturing teams to regularly grapple with manufacturing deviations. The result is slowed or halted production.

In the pre-digitized world, this inefficiency was planned for – scheduling 90 batches to make 80. In this post-digitized age, the confidence interval for producing "golden" batches is closer to one percent. Productivity is yet another aspect of consistency – to "lean out" the waste and unnecessary inventory.

Production productivity, consistency, and reliability are typical success measures brought to bear when justifying an investment in plant-wide information technologies. There are studies from industry analysts and organizations such as MESA International that provide guidance on the positive impact of plant-wide information systems at a production operations level. But manufacturing IT is finally being viewed as a strategic asset. One that impacts the business' ability to respond quickly and efficiently to change, to support corporate initiatives and to execute innovation.

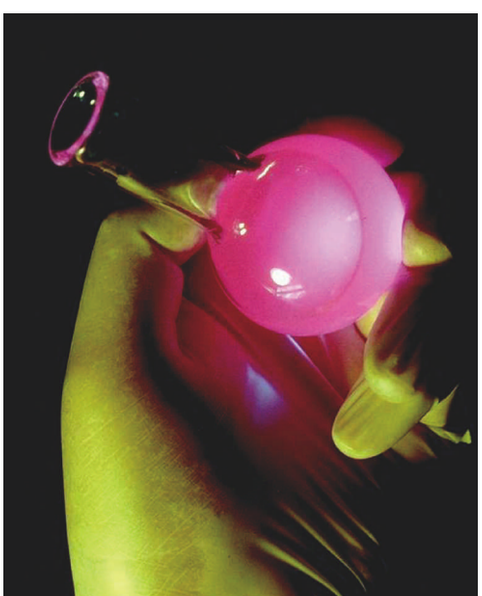
This means bringing an enterprise perspective to the game and gaining a better understanding of the strategic implications that a well-connected enterprise infers. For some pharmaceutical manufacturers, this has created the impetus for organizational, process and policy convergence of corporate information technology and manufacturing departments. It is vital that both perspectives have input into technology investments, architectures and policies that meet mission critical requirements.

It is also critical to involve senior management at the highest levels. Enterprise-wide production and performance management applications eg, manufacturing execution systems (MES) are mission critical as they introduce radical process change.

Executive sponsorship and change management are the common threads within successful manufacturing IT strategies. The control concepts at the heart of such systems (such as adjusting for product potency, process verification, or digital signatures) represent strategic risk management opportunities that warrant senior management visibility and support.

Coming Together: Convergence Creates Synergies

These two cultures and perspectives have traditionally been at opposite ends of the spectrum when it comes to making "turf"



The convergence of manufacturing and IT can present opportunities, as well as challenges for organizations (Source: Rockwell Automation)

discussions. While they exist in the same enterprise and are somewhat dependent on each other, neither typically has a good handle on what the other does, nor do they speak the same business language.

Crossing the chasm between these entities can be a challenge, but one well worth the effort. Improving the flow of information in a manufacturing enterprise is analogous to the impact of a healthy circulatory system on human performance. Production operations are the heart of a manufacturing enterprise, but it is the ability to circulate that information reliably, accurately and efficiently among business and production systems, that helps the organization react faster and enjoy stronger control over desired outcomes.

One of the immediate benefits of blending IT and manufacturing perspectives is a shared vision for creating a modern manufacturing IT architecture. Most manufacturing teams are so focused on getting the product out the door that they typically do not have time to research new manufacturing techniques and/or technologies via seminars and conferences.

IT can help manufacturing management to understand how IT infrastructure supports mission-critical production systems and answers an array of questions: What is a segmented network, and why is it important? What are the pros and cons of wired versus wireless access points? What is a SAN? What data is being backed up and how often? Is stress testing or disaster recovery planning being conducted? How long does the recovery process take? These are just a few of the technology "gotchas" that manufacturing teams need to understand to create effective and scalable support for an IT-intensive production system.

On the other hand, IT personnel need to understand what high-availability means to manufacturing: What are the critical manufacturing parameters, and how must that data be managed, collected and protected? How is this data being used? Where in the process is data being entered, stored and retrieved? These are just a few of the areas that the IT professional needs to know to help create an effective manufacturing IT strategy.

Drawing "Turf" Lines

Production data is an asset that requires care and feeding for it to work for the organization. One of the more common discussions revolves around master data management (MDM). This is a complex topic that needs to reflect the assigned roles and responsibilities of both the people and systems involved in the production process.

Where are the boundaries that define the start and end points of MES, ERP, LIMS and other strategic systems? It can easily become a philosophical and emotionally charged discussion. Nonetheless, it is critical that a consensus is reached between the system owners at senior levels. It is these kinds of turf battles that help organizations synchronize business needs to desired systems capabilities. The outcome helps to determine the systems landscape – and will have a direct impact on the ability to create an agile, responsive manufacturing environment that innovates and competes effectively in the global economy.

Master data management is an essential element in the manufacturing IT strategy that guides the interaction between plant and enterprise systems. This becomes increasingly important as business or supply chain systems such as enterprise resource planning (ERP) are interfaced into execution, quality or other plant-level production management systems to

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aggregate and extract key production data for planning and reporting purposes.

As the enterprise-wide systems landscape architecture unfolds, the need for data management governance becomes paramount. Previously simple plant-level decisions, eg, units of measure or product short-text descriptions, increase in complexity and are fraught with implications from an enterprise standpoint. Governance can help drive conscious decisions that help eliminate points of failure. A well thought-out and agreed upon set of data standards establishes a foundation for systems interface requirements that then drives integration priorities.

For example, by developing enterprise-wide translation tables of process, asset and product descriptions and hierarchies, a company can reduce its need for additional investments in integration middleware – and avoid the addition of potential failure points associated with increasing the complexity of the production systems.

One of the most controversial and debated aspects of systems-related responsibilities is the line between enterprise resource planning and manufacturing execution systems. Formally documenting where systems of record reside and developing a plan for functional responsibility helps to clarify and resolve these issues.

Evaluating the capabilities of strategic systems will quickly show whether ERP can perform as efficiently as an MES or whether the MES can perform planning (such as a finite scheduling) and/or warehouse management. One must be careful not to fall prey to the siren song of sub-optimizing one strategic system because of a capital investment in another.

Demonstrating consistent process control has been a challenge laid down by regulatory organizations for pharmaceutical manufacturing sites. (Source: Rockwell Automation)

While every manufacturing environment has its own unique characteristics and requirements, the following provides an example of a successful approach to dividing up systems "turf":

- ERP – MRP processes, bill-of-material, final usage decision, inventory control, order genealogy, production order generation
- MES – manufacturing process control, master batch record, log books, process data retention
- LIMS – lab results, stability studies, material potency, batch disposition recommendations based on lab results

It is easier to define these roles and responsibilities for strategic/enterprise systems, once system owners or champions have been appointed and moved away from a management-by- committee format.

While this approach does not discourage debate, it ensures that a clear line of authority exists for making a decision on the direction and vision for a given strategic/enterprise system – after the dust settles. Changing business needs may dictate a review of these "lines of demarcation," so that system owners or champions can meet on a periodic basis to challenge the status quo.

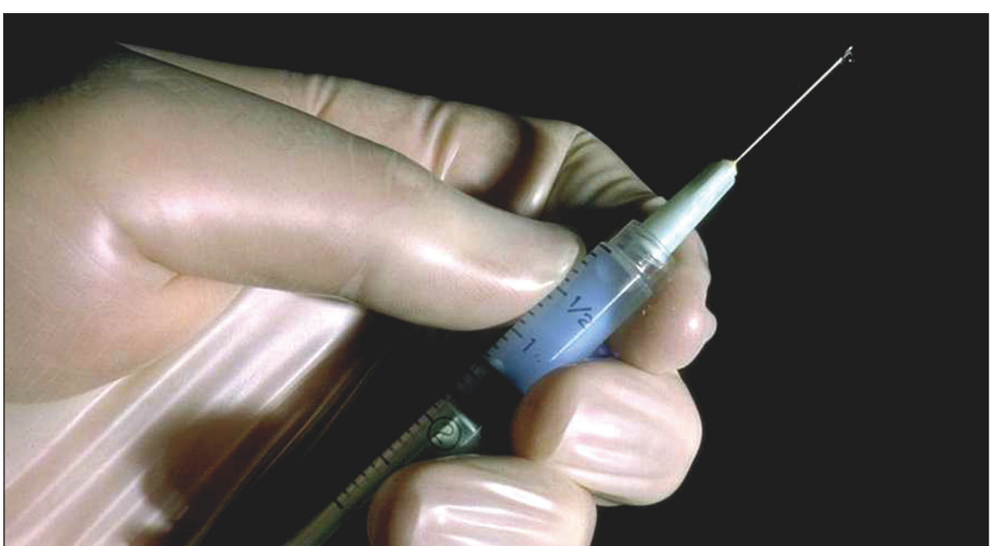
Information: The Next Industrial Revolution

While accommodating change has always been a factor in manufacturing, the scale and scope of change today makes things different. Like many other industries, pharmaceutical manufacturers are experiencing the impact of macro trends that are changing the manufacturing landscape in significant ways. The emergence of a truly global economy and its disruptive influence on business and supply chain models has far reaching implications.

For example, consumer product contamination issues point out the need for better visibility across supply chain networks. Expectations are changing. Customers, partners, suppliers and governments expect more when it comes to the velocity, ease, and accuracy of processes. Technology is evolving so rapidly that companies that apply it wisely in their business processes can realize a true competitive edge in the market.

The result is that pharmaceutical manufacturing operations are being managed as a strategic business asset, including investments in the appropriate technologies to create a "closed-loop" information architecture on an enterprise scale. The implications are many, including the rejection of the traditionally insular view associated with developing and deploying plant-level information systems held by some manufacturing management teams.

Bringing production operations into the digital age is not an easy task, and certainly not one to take on without the help of qualified and trusted partners. But the journey can be exciting and rewarding on many levels – and may be the key to long-term success in the highly competitive, collaborative, and innovative environment that some are calling Manufacturing 2.0. **PA**



(Source: Rockwell Automation)

Automated Tablet Sorting: Raising Efficiency

Angela Dove,
Writer

Artificial vision sorting technology provides accuracy and consistency in the detection of defects in tablets and capsules. It also helps to bring drug manufacturers a step closer to regulatory compliance.

Current US Food and Drug Administration (FDA) regulations mandate a strict adherence to standards of safety and quality before pharmaceuticals are allowed to be released to hospitals, clinics and the general public. Electronic document standards are also guided by 21 CFR Part 11 requirements, which pertain to the traceability of documents that encourage best practices.

Japan, known for its stringency, is moving to open its domestic market to more foreign pharmaceutical imports. Manufacturers wishing to supply pharmaceuticals to Japan, the US, Europe and other developed markets would do well to install processes that comply with or exceed the current markers in pharmaceutical regulatory standards.

During the manufacturing process, capsules and tablets sometimes suffer defects in terms of their shape, size, color, printing and other assorted faults. Laboratories perform sorting operations to eliminate the defective tablets, ensuring the integrity of the batch. There are three options to choose from:

- Manual sorting, which is inspection by hand
- Automated involving machines that are specially built for the task
- Discarding the entire suspect batch

There are advantages and disadvantages for each option, and the automated route may not necessarily qualify as the best solution for all manufacturers.

Naked Eye Sorting

The manual inspection process is a relatively simple operation to set up, requiring the installation of a few inspection belts and the hiring of staff. There is no need for large capital expenditures, nor is there a requirement for technical training. To a certain extent, manual inspection is a scalable operation where output can be easily increased through the addition of inspection belts and man-hours.

Manual sorting relies solely on individual human judgement, giving rise to varying standards of quality control. This can often end in inconsistent sorting results between the operators. Furthermore, each individual operator may also lack uniformity in his/her own judgement of quality throughout the entire sorting process.

This means that the manufacturer can potentially be left with a bin of inconsistent output, and the decision of whether to put the drugs through a second round of sorting – this time with stricter (and more time consuming) criteria, or to discard the output altogether.

This sorting process is labor-intensive and is limited by the speed of its operators. A low throughput can result in weeks of delay. Should there be consecutive problem batches, production may bottleneck at the inspection stage, further slowing down the entire production process.

Since the process relies on human judgement, the results of an operation are not repeatable for subsequent batches. This produces a lack of validation and without the collection of data, determining the causes of defects can be difficult.

(Source: Proditec)

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A manual inspection process therefore, does not allow meaningful documentation to be produced, which also means that international pharmaceutical regulations like 21 CFR Part 11, cannot be satisfied. This can create problems in getting specialty drugs to market, or worse, result in a product recall.

The Automatic Option

Given the inherent problems associated with manual sorting, automatic inspection could present a more efficient alternative.

Making an investment in the automation of the sorting process can be costly, both in terms of finances and time. Often, it requires a sizeable upfront capital investment. However, this has to be weighed against the fact that typically, automated sorting machines can post good returns-on-investment. With average utilization, turnaround times of two years or less are not uncommon.

Put into perspective, the technology may turn out to be a cost-effective investment, in the light of the astronomical cost of discarding batches or of products recalls. In addition, automated sorting machines utilizing artificial vision are becoming increasingly user-friendly and can be operated by non computer-literate staff.

Upon purchase, the automated inspection machine will require some time – up to a few weeks for the validation process to be fully completed and tested for Installation Qualification (IQ) and Operational Qualification (OQ). Most vendors offer validation packages together with the machine's set-up and start-up, to facilitate the handover process.

Automatic inspection offers other advantages. Using an array of sensors and dedicated lighting, automatic sorters carry out checks for more than just surface defects. Products with unusual characteristics (eg, bi- or tri-layer tablets, tablets with laser-drilled holes, embossed tablets, transparent and partially filled capsules) require critical inspection and should be examined with the precision that artificial vision machines offer. Typical optical systems are built to detect defects that have a size of 100 microns or less. Inspection machines can also act as real-time process tools, helping to maintain production standards, quality and consistency.

Automation offers the advantage of high volume, high speed, accurate and non labor-intensive sorting. For example, a batch of one million tablets can be processed in a single sitting. In comparison, a manual process involving two operators working on a single conveyor belt could take up to four shifts to complete.

The technology for automated sorting has achieved such a level of usability that the average worker with no special training can comfortably operate the machine. Coupled with inbuilt, fail-safe ejection systems, artificial vision inspection machines can help a laboratory achieve higher levels of productivity and efficiency.

Manual sorting is labor-intensive and is limited by the speed of its operators. (Source: Proditec)

The process of automatic sorting is accomplished according to pre-established parameters which can be repeated across batches, yielding verifiable results and allowing for validations and audit trails. Built-in software also provides a statistical analysis of defects. This allows the manufacturer to track and identify the root causes of problems and to resolve them for future production runs.

Perhaps most importantly, automated sorting machines produce records that satisfy 21 CFR Part 11 and other regulatory requirements, providing document chain consistency. By ensuring that documents are in line with existing standards, automatic sorting can bring a manufacturer one step closer to regulatory compliance and to international markets.

Manual vs Auto

Manual and automatic inspection methods both come with their own unique advantages and benefits, with each suited to different circumstances.

Manual inspection methods are labor intensive and can be prone to errors and inconsistencies. They do not allow for an accurate analysis of problematic issues, nor do they provide verifiable documentation. However, manual sorting is easy to carry out, and may be one of the most cost-effective solutions for small amounts of tablets or drugs which are not targeted at regulated markets.

In contrast, inspection machines are more effective and consistent at spotting defects. Their high sorting capacity, precision and ability to track and analyze defects can translate into higher productivity and lower waste. By automating the sorting process, laboratories can also save on labor. Automatic artificial vision machines are also a suitable option for a manufacturer seeking to ensure compliance with FDA regulations.

Automated sorting technology based on standard-compliant machines allows companies to meet regulatory requirements, helping to open the doors to foreign markets.

The science of artificial intelligence in industrial vision pharmaceutical sorting machines is continually improving. For example, Near Infra-Red (NIR) technology for high-speed sorting machines provides a solution against batch contamination. With the accelerating pace of scientific advancement, it appears that artificial vision sorting technologies will be enhanced with additional capabilities in the near future. **PA**

Overcoming Challenges

Despite a slowing global economy and challenges in the regulation of export markets, opportunities for expansion are still available to the bioprocessing industry in Asia. **ERIC GRUND**, director, Fast Trak Services, GE Healthcare tells us why.

How do you think the bioprocessing industry will cope in current economic climate?

The current economic climate will not stop consumers from becoming ill and so better medicines and treatments will continue to be sought. The fundamental question for the bioprocessing industry, however, is whether or not global healthcare systems will be impacted. If for example, the US implements major changes to provide cheaper healthcare, international biotech companies will likely face pressures to reduce costs.

The lower manufacturing costs available in Asia will be attractive for companies to relocate their manufacturing, which will in turn enable potential growth across the region. Another factor pertains to possible changes to the legislation on biosimilars, enabling them to enter the market with reduced regulatory hurdles. This would in turn encourage the bioprocessing industry to manufacture these drugs.

The major advantage for biomanufacturers in Asia is the reduced cost of labour. But what is important is that there is an availability of competent scientists and modern technologies ensuring that there is no compromise in the quality of labour.

PharmaAsia: What are the challenges?

Eric Grund: Compliance with the regulatory authorities in Europe and the US is fundamental for an Asian manufacturer to be successful in these markets. However, the required level of expertise is not always readily available. Current regulations in the US also do not allow biosimilars to enter the market easily, making it difficult for Asian companies to capitalize on this market.

It also looks like American and European regulations might become even tougher. To ensure regulatory compliance, companies can engage a service provider to obtain consistency in asset management and facility validation, a service that our company is offering.

In its annual report from 2008, the Organisation of Pharmaceutical Producers in India (OPPI) published data showing that the Indian pharmaceutical market grew at a compound annual growth rate (CAGR) of 13 percent over the previous four years, indicating the growing domestic demand. Manufacturers can make the most of this demand and establish successful facilities by supplying complex products such as vaccines, plasma proteins, monoclonal antibodies and insulin – but only if they can combine this with an excellent safety record.

We believe that process development is one of the major challenges that biomanufacturers are faced with – arriving at robust, reliable, scalable and economical processes can be difficult. One way to overcome this is by leveraging on technology. For example, the use of 96-well plates for High Throughput Development (HTPD). This allows fast and efficient evaluations of up to 96 chromatography conditions per plate, thereby reducing experimental time and decreasing sample consumption.

This approach is even more powerful when combined with an automated workstation: it substantially shortens the time spent on process development whilst allowing the investigation of a much larger experimental space, resulting in a better understanding of the process.

PA: What are the advantages of using disposable systems?

EG: Implementing disposables in a bioprocess eliminates the need for laborious and time-consuming cleaning processes and of course, the associated cleaning validation procedures. The risk of cross-contamination between batches and projects is eliminated, providing the flexibility for contract manufacturing organizations (CMOs) that need to switch products from batch to batch.

Furthermore, disposable technology can help lower operating costs, allowing for increased yields (through optimized productivity) and faster time-to-market. Such technology helps the achievement of operational excellence by removing unnecessary steps, whilst, at the same time, allowing facilities to become more adaptable to the changing needs of the market. This disposable technology can be applied to both upstream and downstream applications ensuring consistency from end to end.


Eric Grund

PA: What do you mean by operational excellence?

EG: Operational excellence can be described as the goal of achieving superior yields, lead time and throughput whilst eliminating waste. It is a systematic approach to attaining world-class performance in productivity, quality and delivery of services and/or goods. Two effective tools for achieving this are Lean and Six Sigma. The main focus of Lean-enabling technologies is to reduce waste, which can occur through overproduction, transportation, inventory, defects and underutilization amongst other issues.

Regulatory

For example, the increased threat of pandemics, such as influenza and severe acute respiratory syndrome (SARS), has highlighted a need for the development of new vaccines and improved manufacturing processes to enable fast and efficient production. The cost of typical vaccine manufacturing makes it difficult for any given country to afford self-reliance for pandemic flu vaccine supply. However, Novavax recently announced that it is using innovative disposable systems for its Virus-Like Particle (VLP) Vaccine Technology to ensure a low capital cost of manufacturing via single-use systems.

PA: What other steps can companies take to become lean?

EG: Some examples would be in providing tools for media screening and column packing as well as resins that can cope with high titers and specific purification issues, resulting in higher productivity. Biomanufacturers should look into adopting these technologies to enhance the effectiveness of their processes and to speed up process development.

One of the main features of the Lean concept is to critically review process steps. For example, if the same quality result can be achieved with fewer steps, process engineers can implement the concept to remove unnecessary operations.

> **"Current regulations in the US also do not allow biosimilars to enter the market easily, making it difficult for Asian companies to capitalize on this market.**

Applying at least three chromatography steps to purify protein pharmaceuticals, such as antibodies, is still considered sacrosanct by many. However, there are at least two published variations of a two-step chromatography process that claim to meet quality objectives in many applications.

Two-step purification methods may not reduce the direct costs by much, relative to other improvements. But by taking a holistic view, we can see smaller buffer volumes being needed and consequently, a reduction in buffer preparation and storage requirements.

PA: What will the next decade bring?

EG: Challenges facing bio/pharmaceutical production during the course of the next decade will lead to more flexible development and manufacturing, multi-product facilities, and tackling the issues of biosimilars and generics.

There are huge pressures on the industry to achieve operational excellence. The current economic climate may prevent companies from investing vast sums of money into completely redesigning development and manufacturing processes. However, companies should maintain a long-term global perspective: never to lose sight of the need to provide innovative medicines. **PA**

Against The Tide

At a time where many companies are scaling down their expansion plans, **ROB NAIL**, GM, Agilent Automation Solutions is expecting double-digit growth from his business unit in Asia Pacific. *Michael Tham* reports

Rob Nail started Velocity11 with three friends in 1999. Prior to this, he was employed by Incyte Corporation where he worked with research and production labs to learn how to apply technologies to the evolving life sciences research processes.

Nail earned his Master of Science in manufacturing systems engineering from Stanford University where he focused on design, organizational development and entrepreneurship. He graduated with a Bachelor of Science in mechanical and materials science engineering from the University of California.

Velocity11 joined Agilent in December 2007, and has been undergoing integration procedures with the latter in the last year. The former has about 200 employees and is part of the parent company's Life Sciences and Chemical Analysis (LSCA) business unit.

As part of the integration, Velocity11 has been renamed the Agilent Automation Solutions Group.

Agilent achieved a revenue of US$5.8 billion in 2008 and currently employs about 19,000 staff worldwide. Its Asia Pacific regional center is located in Singapore and employs about 450 staff in R&D, sales and business hub activities.

Rob Nail

PharmaAsia: What are your expansion plans in Asia?

Rob Nail: Our main target markets are countries that have a focus on life science research, namely China, India, Singapore and Japan. Despite the current global economic slowdown, we expect our business unit to experience double digit growth in Asia Pacific this year, through the sales of technology for applications in genomics, proteomics and biology.

For many companies that develop automation products for life science research, about 10 to 20 percent of their business is in Asia. Whereas for us, it's currently at about one percent. At the same time, I believe that there are needs for automation that have not yet been fully addressed. This means that there is still potential for us to expand in this region.

In terms of sales, we will be using the regional channels that our parent company has already established. As most experiments can be automated, the challenge is for us to tailor instrumentation for specific applications.

While many companies are cutting back on spending during this period, I believe that investments in instrumentation will still be taking place. We expect to be taking market share even during this less-than-rosy economic situation. We are looking forward to one major product release every year.

PA: Tell us about your integration process with Agilent.

RN: We have moved our headquarters into their site in Santa Clara, US and are integrating our business processes such as accounting, sales and manufacturing into their SAP system. In Asia, we are moving our instrument manufacturing into Agilent's 800,000 sq ft facility located at Yishun, Singapore and are expecting to commence operations in the next four months.

We have a growing team, currently of six people dedicated to manufacturing who are involved in setting up the facility. They'll be making a trip to the US to finalize the products before coming back to Singapore to setup the first pilot production lines. We aim to setup three product lines by June.

In the meantime, another team will be in the US to learn about the next set of products, before coming back to Singapore to repeat the same setup process.

The products that are manufactured at this facility will be for the Asia Pacific and US markets.

The strategic decision to shift production from the US over to this region will reduce our product and service costs in the long term.

PA: What prompted your decision to become part of a larger company?

RN: Drug discovery companies typically require a number of procedures, instruments and applications to support several hundred thousand experiments to develop drugs. As an instrument provider, I realized that the opportunity was for us to become a partner of these pharmaceutical companies. I wanted to work with them to provide complete solutions by integrating all the "pieces" required for drug development. Velocity11's strengths lie in product development and automation, providing the synergy that Agilent required.

For years, I was faced with the financial and cultural challenges of growing my company's infrastructure in Asia. Via this partnership, I instantly gained access to the facilities and markets in Singapore, China, India and Malaysia.

We're now developing synergies with other divisions within Agilent. These are areas that don't take as much R&D investment and time. It involves combining two existing products into something more powerful. In high-performance liquid chromatography (HPLC) analysis for example, the current conventional approach is for a scientist to load a plate onto a HPLC detection device and run it. The analysis normally takes between five minutes to an hour to complete.

What we want to achieve, is to add "walk away" time to the equipment. We're working on combining our BenchCel workstations with the LC1200, a HPLC device. This development will allow the scientist to load on a full stack of plates for analysis, leave, and return the next morning – by which time the machine would have read through the full set of plates. Our workstation approach basically allows labs to adopt an incremental approach in their equipment investments.

PA: What is your approach to product development?

RN: Lab experiments involve a number of different steps and require various "pieces" of equipment, eg, liquid handling processes, plate processes, storage, robotics, software. Generally speaking, there are standard components to all of these different automation needs for life science research.

Many of these standard components are core instruments that we manufacture. In terms of creating a complete workflow solution for the customer, we also recognize that there are other companies which build equipment that we don't manufacture or specialize in, for example, analytical tools such as devices for fluorescent plate reading.

We are therefore open to working with competitor companies like Thermo Fisher, Hamilton and Tecan to come up with solutions for the customer. The customer basically just wants an answer to their problem, and we work to provide the answer in the best way possible. In some instances, this means bringing in third-party equipment from these companies.

This year, we've launched a few initiatives and products. One product we've just launched at the LabAutomation show in US is the Direct Drive Robot. The robot is central within each of the systems that we sell and it can interact with all the different equipment within a system.

PA: Tell us more about this technology.

RN: I believe that we have developed the first industry-scale robot for use in research labs. The reason I say this is because many of the robots in labs today are designed for operation in manufacturing plants. They adopt a production line approach and are suitable for applications that are setup to operate in a fixed routine. Such robots are difficult to teach and take a long time to implement.

In research applications, scientists tend to move quickly from one experiment to another, with each experiment requiring different components. They therefore require greater flexibility in automation. We've developed a robot that is easy to teach and that allows us to continue to develop protocols quickly for our customers.

We've integrated a 'teach' button into the robot that puts it into a "near-zero gravity" free-float mode. When scientists want to teach the robot how to operate in a new experimental environment, they simply move it to different location points within that system. The robot instantly learns these various points. Using a three-dimensional interface in the accompanying VWorks software, the user then informs it about the types of components that are in the system. Even with large systems that involve a hundred different instruments, the robot can be completely taught within minutes.

Another key aspect of the technology is its safety feature. Research scientists are fundamentally different from production line engineers. The former are not as familiar with how robots move or what the limitations are. The typical six-axis industrial robots have the power to literally punch through walls, making them dangerous to use. Our robot however, uses direct-drive servo motors. While this delivers the required speed, it however, carries little momentum. This means that it can stop instantly even if it runs into an object at full speed – without causing any impact. This provides safety to scientists who need to move into the system to re-teach and re-configure the robot to perform different tasks.

We've launched an updated version of VWorks, which is the software control package that runs our systems. This process control software features a complete drag-and-drop interface to set up complex protocols. It has an easy-to-use graphical user interface (GUI). This means the scientist just needs to be aware of the required steps for an experiment. For example, he just needs to specify that he wants to do a liquid handling step, or a mixing step etc, and the software knows where everything is at and what the robot needs to do. With this technology, there is no need for complex programming procedure inputs by the user.

The software also allows for multiple simultaneous protocols. For example, the user sets up a protocol that runs for three days. Another scientist from a different lab also wants to use the system to perform a separate process. Given such a scenario, the system offers the flexibility of simultaneously running a separate protocol within the same system, with the software being able to sort out and organize all the required steps. This capability allows labs to take on and perform additional tasks without requiring additional investments for multiple systems.

The software is interoperable with products from different manufacturers. Whether it's a plate reader from Tecan, a plate washer from Biotek or an incubator from Thermo, it can operate virtually any instrument on the market. It has the flexibility to run just one or a hundred instruments, using the same interface.

PA: When can we expect to see the Direct Drive Robot and VWorks software in Asia?

RN: These products will be made available in Asia in April or May. Companies that already own a number of lab instruments and analytical tools can buy the robot and software to integrate and automate their work processes.

In terms customization, modifications will be made to the power supply, based on the destination country. As the documentation is primarily in English, we're also working to meet the various language requirements of different countries in the region. **PA**

Finding a Cure

Accenture

Pharmaceutical companies need to deal with inefficiencies in their supply chains for healthy market expansion.

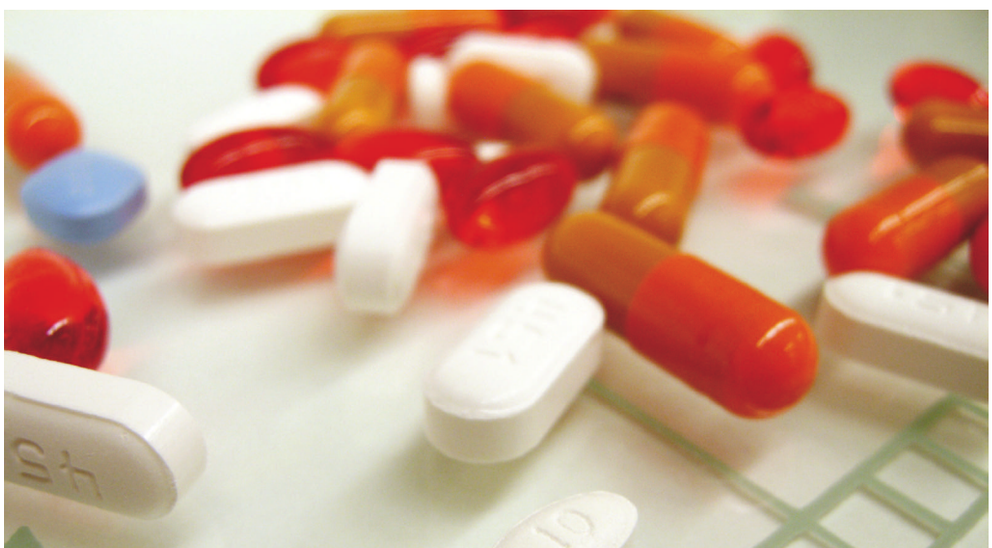
Patent expirations, pipeline gaps, the R&D productivity crisis and intensifying regulatory pressures are some of the challenges confronting the pharmaceutical industry. At the same time, a number of opportunities have also emerged.

The steady maturation of biotechnologies and a growing emphasis on personalized, "patient-centric" health care has provided avenues for growth. In addition, digital developments that can make data available anytime, anywhere, and new sourcing opportunities in emerging markets also offer prospects for expansion.

Such growth, however, requires the right global operating model – one that is facilitated by a forward-thinking supply chain and a growth-focused global agenda.

Research shows that information-rich, flexible supply chains that are built around customer needs, enable the capabilities that are critical to high performance. Supply chain excellence is directly tied to a company's financial performance. Today, the pharmaceutical supply chain lags behind other industries in terms of innovation and effectiveness.

This does not dismiss the cost-cutting and cycle time reduction measures that have contributed to a reduction of almost 30 percent in cost of goods sold (COGS) between 1990 and 2006 (see Figure 1). Nor does it belittle the operational efficiency initiatives that pharmaceutical companies have undertaken. These efforts, however, are rooted in an outdated operating model that is largely insourced, geographically localized and concerned with operational efficiency rather than growth.



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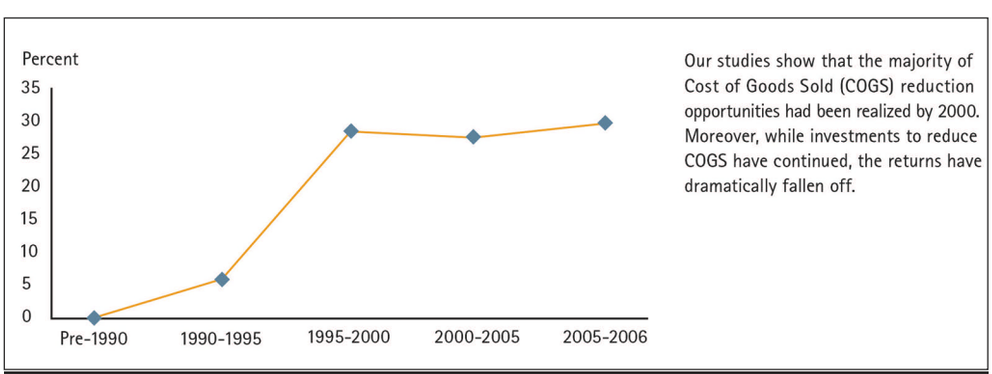

Figure 1: Cumulative reduction of COGS between 1990 and 2006 based on 17 pharma companies.

Learning by Example

The pharmaceutical industry was among the first to internationalize, taking advantage of foreign trade zones, inter-country tolling gains, and other benefits of localized operations.

Yet despite this global presence, many companies still have a long way to go before their global supply chains match that of Halliburton – the integrated oil field services, construction and US government contracting company. The company's operating model supports a globally distributed production capability. Pharmaceutical supply chains also need to work on setting industry standards, such as those achieved by Inditex, a Spanish apparel group.

Many traditional pharmaceutical companies have also not been able to catch up with the newer, smaller biotechnology firms that have effectively reengineered the latter's supply chains and related infrastructure.

Companies in other industries have taken different approaches in optimizing the potential of their supply chains. Some have developed entirely new operating models; others have transformed their existing models to enable "virtual supply chains" that have a greater focus on managing knowledge, data and relationships, rather than the actual physical product.

Today's pharmaceutical industry confronts an inevitable and seismic shift in the transactional processes and capabilities that comprise about 75 percent of its supply chain activities – from a largely insourced and localized operating model to a primarily outsourced and globalized operating model (see Figure 2).

The existing operating model limits pharmaceutical companies' abilities to make major improvements in their capabilities. To truly achieve these changes and refocus their internal resources toward more analytic and efficient

Drug Manufacturing

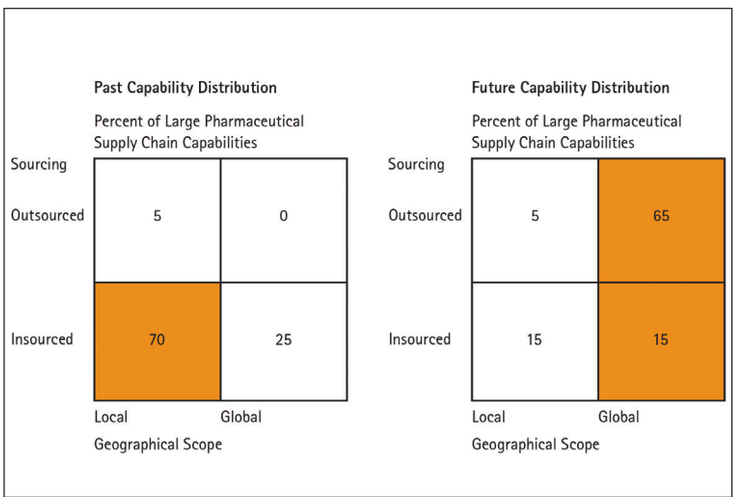

Figure 2: A shifting capability focus.

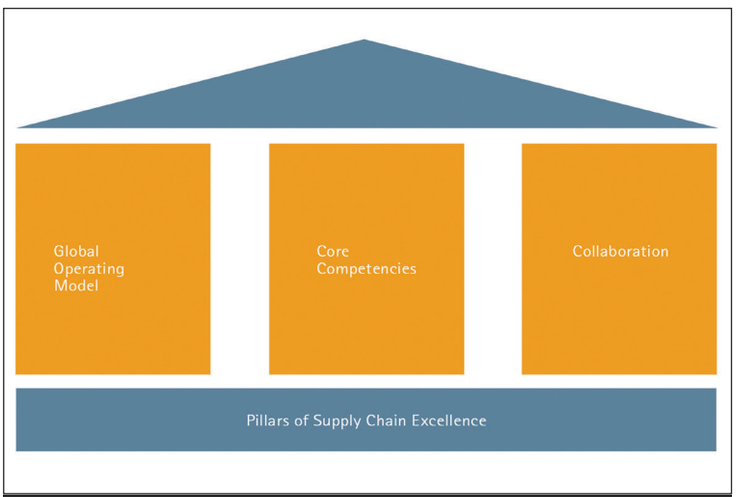

Figure 4: The pillars of supply chain excellence.

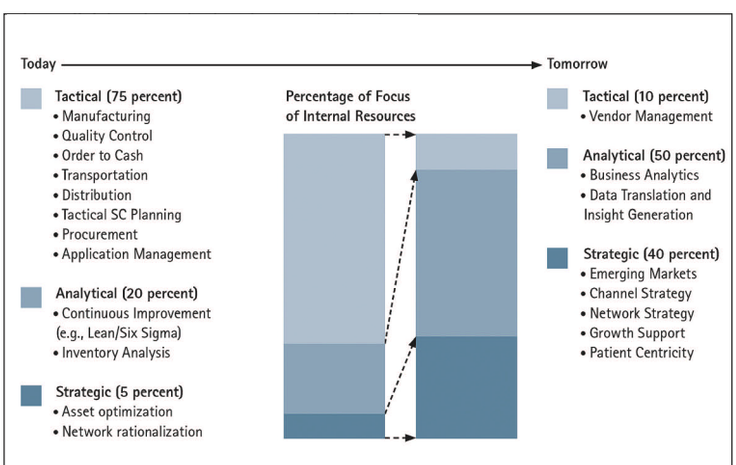

Figure 3: Internal supply chain focus and skill-set.

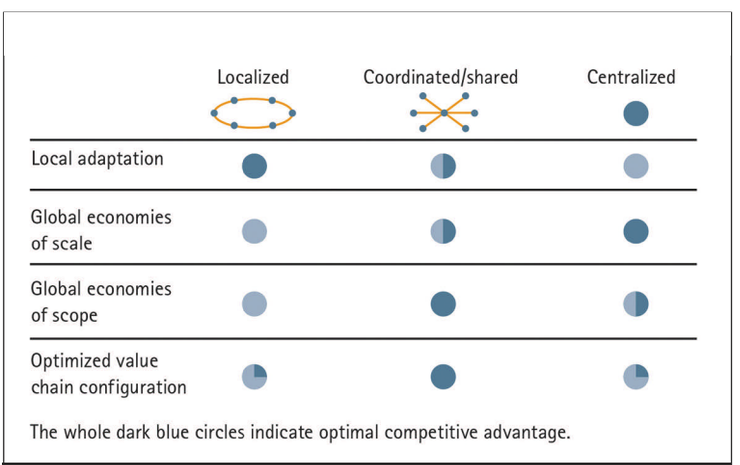

Figure 5: Different operating models enable different layers of profitable growth.

strategic tasks, the underlying operating model must be fundamentally changed (see Figure 3).

Supply chain excellence in pharmaceuticals rests on three pillars (see Figure 4):

- Global operating model
- Core competencies
- Collaboration

The global operating model is a prerequisite for good performance across the various industries. More than half of the pharmaceutical industry respondents in the Accenture Global Operations Survey cited a "global supply chain network that achieves simultaneous objectives on quality, cost and time to market" as the capability that is the most likely to help them achieve their profitability targets.

It is important, though, not to confuse the terms "global" and "centralized". Depending on individual circumstances, some companies may require a centralized model while others will not. There is, however, a systematic approach to making this key decision. There are three distinctive operating models: localized, co-ordinated/shared and centralized. These convert the global presence of a company into a competitive advantage and a platform for profitable growth, by enabling four different levers. These levers are: local adaptation, global economies of scale, global economies of scope and optimized value chain configuration (see Figure 5).

If the goal is to improve reach and customer relevance in local markets (local adaptation), a localized model will be optimal. If, however, the principal aim is to spread fixed costs over larger volumes, thereby reducing capital/operating costs per unit and consolidating purchasing power, the centralized model may be more suitable.

A coordinated/shared model, by contrast, will improve the ability to serve global customers and help build critical mass in selected activities by leveraging a broader knowledge base – global economies of scope. It will also help reduce costs, improve performance and mitigate risks, with the optimized value chain configuration.

As Figure 5 shows, the coordinated/shared approach touches on more levers. However, as it may not be applicable to every company, finding a strategic and cultural fit should be the guide for making the right choice. Moreover, operational capabilities must be aligned to enable the chosen mix, while being flexible enough to support its evolution.

Consideration of the product portfolio is also necessary as a diverse portfolio with high volume may even require more than one supply chain.

Core Competencies

Excelling at the right core competencies can differentiate a company from its competitors. Almost 67 percent of respondents in the Global Operations Survey identified "tight links with customers and suppliers to obtain supply/demand visibility" as the single biggest

challenge they confront in effectively managing their global operations.

A similar proportion cited "effective coordination of external and internal activities in support of a new product launch" as the key to achieving profitability targets. Almost 69 percent named "integration of local market needs with global designs, research and development functions," as the characteristic of a global operating model most likely to ensure innovation and speed to market.

These and several other desired competencies are aligned with those of the Accenture Global Operations Solution – a holistic, six-component approach to global operational management. This solution applies across strategy, supply chain and other business functions that are necessary for staying competitive in the current rapidly evolving global economy (see Figure 6).

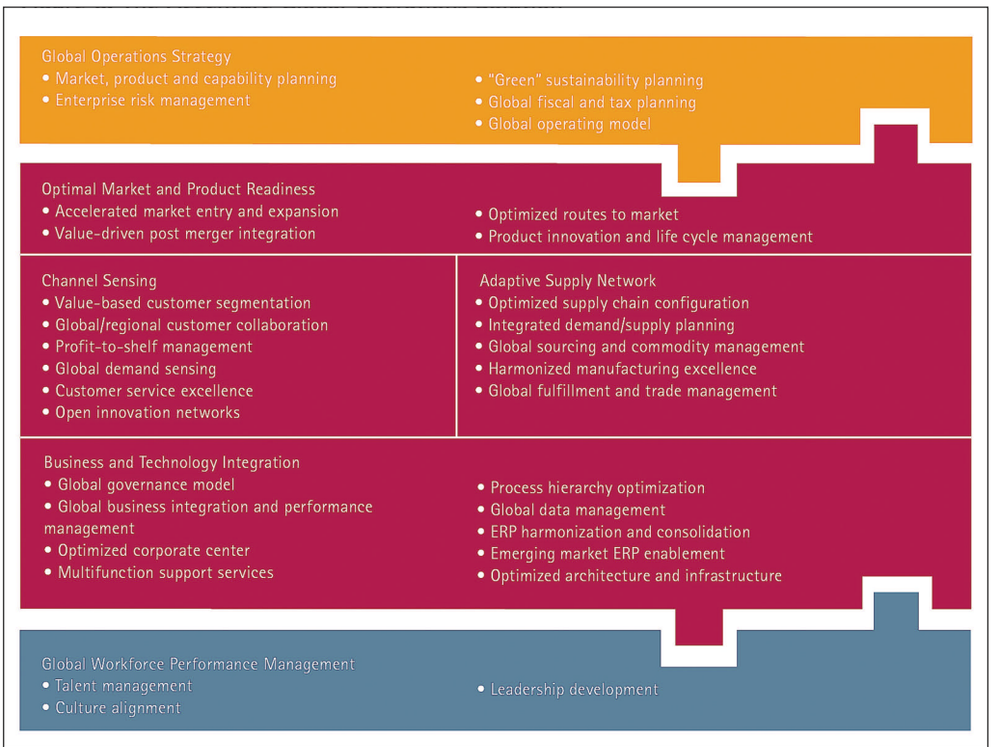

Figure 6: The Accenture global operations solution.

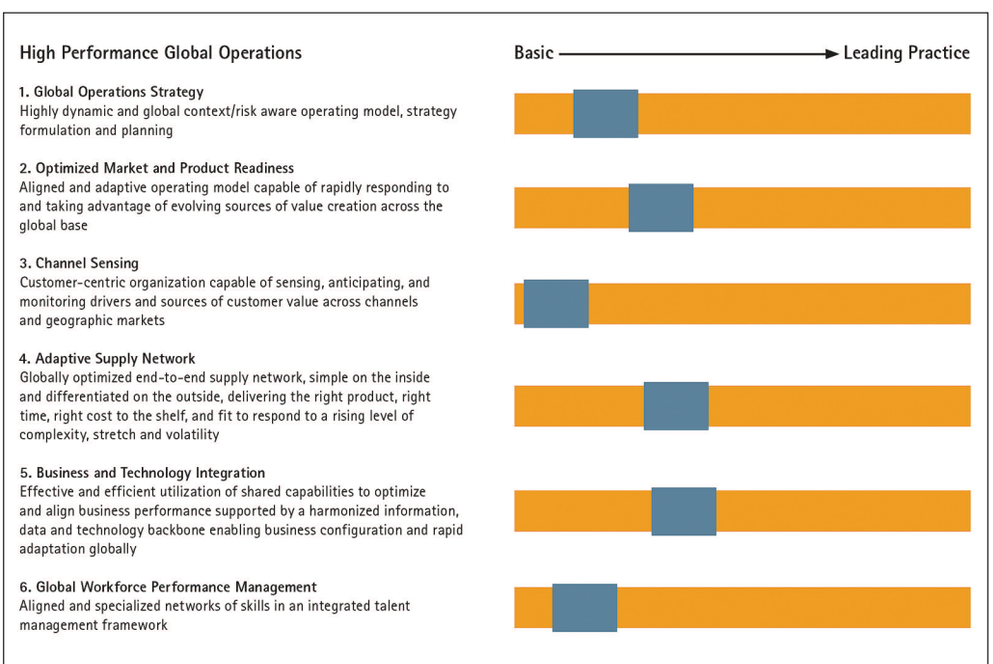

Figure 7: Global operations mastery remains elusive.

A global operations strategy is essential. It starts with market, product and capability planning to recognize, track and respond to market opportunities as they shift and change. The strategy must also encompass capabilities to monitor, manage and mitigate risks, as well as handle a multitude of tax and fiscal regimes. It should also be about making environmental sustainability a sound business proposition.

Without a global operations strategy, a global operating model would not work. Similarly, the optimal market and product readiness and adaptive supply network components would not apply.

Inditex's mastery of these components or competencies demonstrates its understanding of supply chain efficiency. The Spanish apparel maker, which owns the Zara fashion chain, can turn something seen on a catwalk into a store item, in a fraction of the time it takes its competitors to do the same.

Its designers receive real-time information about customer buying trends directly, via hand-held computers from its individual managers located at more than 3,000 stores worldwide. The designers then send specifications from a centralized design and production center to all points in the production process, including outsourced manufacturers. Individual pieces are tracked by bar code through the garment assembly production and shipping process, right through to the store.

In comparison, the pharmaceutical industry falls short, and more work is required to develop such capabilities. Indeed, when respondents were queried on how effectively they were implementing the components required for supply chain efficiency, the answers were not encouraging (see Figure 7).

Effective Collaboration

In an era of constant and complex change, pharmaceutical companies need to develop collaborative relationships with their partners and customers, as well as entities within their organizations. No fewer than 75 percent of survey respondents recognized this need. As the examples from other industries have shown, the right kind of collaborative partnership can deliver significant supply chain benefits.

These benefits are especially noticeable in consumer goods, where collaboration between manufacturers and customers (dealers, distributors and retailers) has decreased inventory by as much as 40 percent and boosted sales by up to 45 percent. It has also led to an 11

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to 12 percent rise in in-stock availability, as well as a substantial decline in lead time and rushed orders.

Consumer electronics company, Sony, tackled the process inefficiencies in its inventory control by implementing an enterprise resource planning system that allowed the company to collaborate with key retailers in forecasting and replenishment planning. The collaboration has helped shrink selling, general and administrative expenses to less than 10 percent of sales and has reduced committed assets by halving inventory.

The pharmaceutical industry similarly needs to refocus its efforts and manage its relationships for key, growth-driving capabilities like product launches. It has much to learn from companies in other industries that have expanded the concept of outsourcing to include the handing over of the external responsibility for an entire process, or even the whole supply chain, instead of struggling to manage a myriad of tactical supply chain relationships in-house. However, a focus on collaboration across the extended enterprise will be required (see Figure 8).

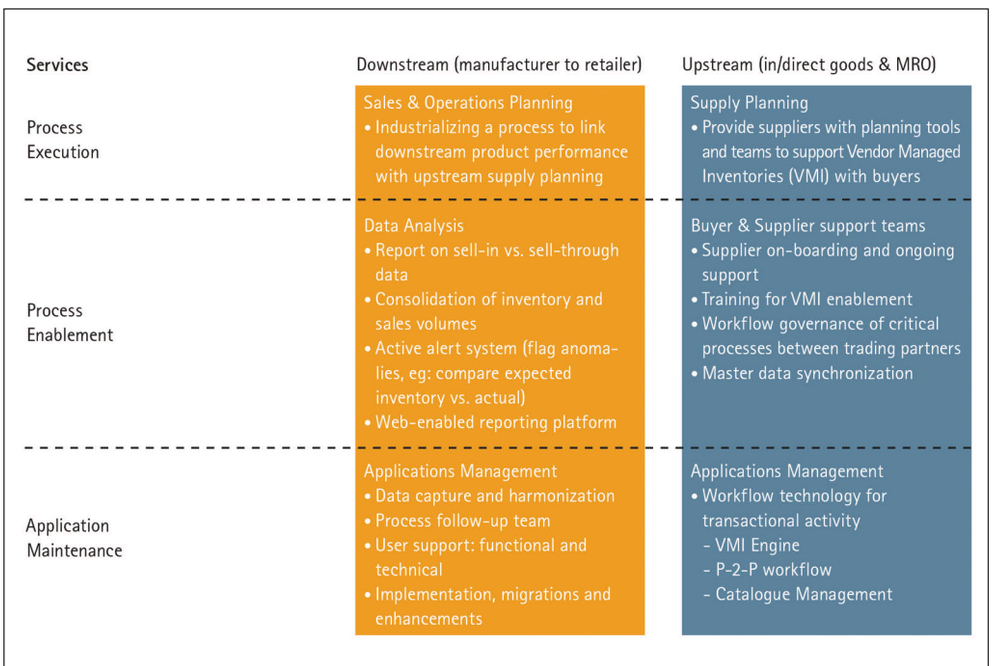


Figure 8: Supply chain collaboration in pharmaceuticals.

Leading companies in other industries demonstrate greater integration, communication and collaboration both externally and internally. While a strategic relationship with every pharmaceutical client is clearly unnecessary, collaborative arrangements with key customers, like major retailers, could enhance supply chain efficiency. Currently, however, the pharmaceutical industry is still not collaborating well enough with its external partners, whether globally or regionally.

The Next Step

The pharmaceutical industry is foregoing the potential for revenue increases of one to two percent a year and annual cost savings of between $12 and $32 billion, by failing to make the adoption of the three pillars of supply chain excellence a priority (see Figure 9).

In adopting this concept, pharmaceutical companies will be able to trigger several value levers, in particular those that will boost profit and shareholder value. Value levers include product innovation, new market penetration, customer segmentation, customer service, value-added supply chain services, lifecycle optimization and a reduction of time to market.

Pharmaceutical companies should assess their own supply chains and ask the following questions:

• What is the operating model that best positions the organization for success?

• Can the organization redefine its core competencies to differentiate itself from the competition, while focusing on developing the skills to sustain these competencies?

• Can the organization take steps to develop more collaborative relationships with its partners and information sharing systems? (Opportunities and risks need to be taken into account so that these partners have an equal stake in the success of outsourcing initiatives.)

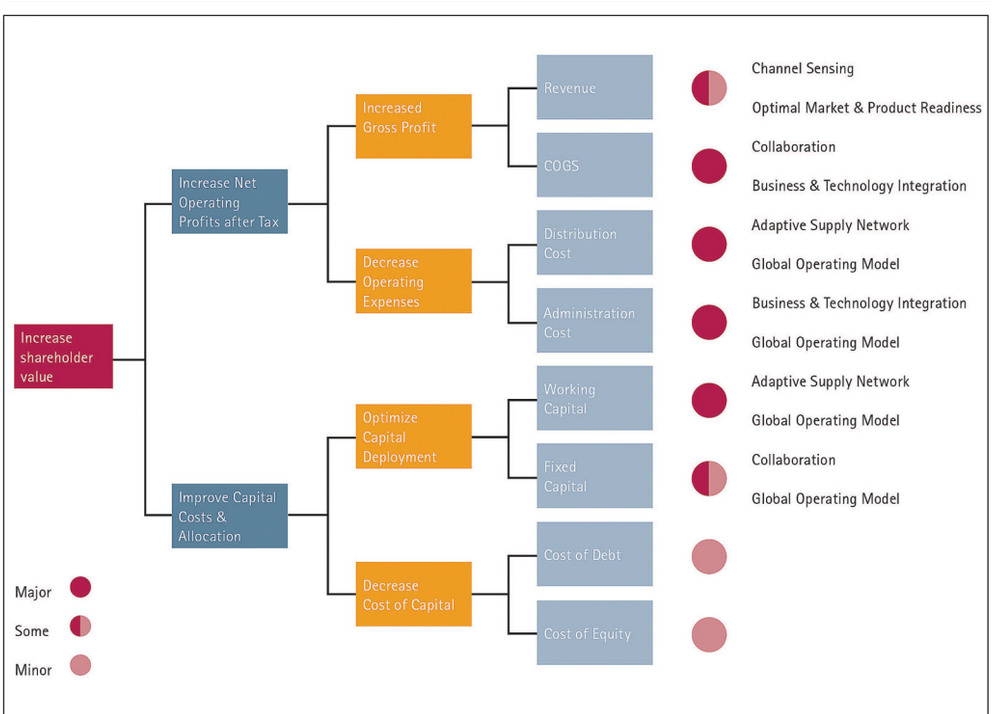


Figure 9: Value tree impacts of mastering the three pillars.

As every company is different in terms of size, challenges, capabilities and geographies, each will take a different path to unlocking the potential for high performance in its supply chain. All, however, should recognize that a supply chain focused on innovation and growth is the key to future value creation. **PA**

Product Focus
Automation/Robotics

Non-Stop Petri Dish Filling

The Mediajet 540 Automatic Media Preparation System from Integra Biosciences is a compact automated Petri dish filler that provides a reliable "walk away" operation. It uses a mechanical dish guidance system, monitored by a set of sensors throughout the filling process.

The software is intuitive and allows the easy calibration of the system. Operational downtime and media losses due to "dish jams" resulting from variations in the diameter, shape and rim profile of plastic Petri dishes are eliminated.

The product has a Media Spread Function capability that allows the efficient use of media by ensuring homogeneous distribution and an even surface. By regulating the agar level in each dish, up to 30 percent in savings can be achieved on media use, compared to some traditional systems.

Integra Biosciences, www.integra-biosciences.com

Vision System for Defect Detection

The In-Sight Micro from Cognex is a complete vision system designed for sensitive high-speed inspection. Measuring just 30mm x 30mm x 60mm, the device is ideal for mounting in tight spaces on robots, production lines and machinery. It also offers flexible mounting capability with a non-linear calibration tool that enables mounting at angles of up to 45 degrees for hard-to-reach applications.

Its VisionView 700 operator interface panel makes it easy for users to monitor production processes without a PC. Once connected, the interface panel automatically detects any Cognex vision systems on the network and simultaneously displays information from up to nine vision systems.

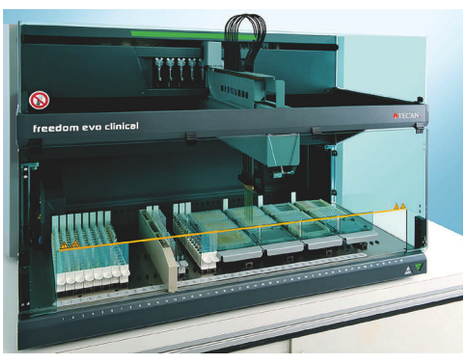
The EasyBuilder configuration software's simple point-and-click approach makes it easy for setup and deployment.

In the pharmaceutical industry where impurity and defects detection plays a make-or-break role in the production and packaging processes, the In-Sight Micro is able to automate precise and in-depth inspection at high speeds, eliminating impurities and defects for sterile products.

Cognex, www.cognex.com

Sample Preparation and Splitting on One Platform

Tecan has developed Freedom EVOlution 2.1. It is a software for EVO Clinical, a 98/79/EC-IVD compliant, open and configurable liquid handling platform for a range of in vitro diagnostic applications. The software allows laboratories to integrate several applications on one instrument, and this version offers additional application areas – sample splitting and archiving, in addition to all the existing sample preparation functions.



The software makes it possible to automate the splitting of source tubes into multiple destination tubes, and the archiving of source tubes into archive plates, without the need for a Laboratory Information System and Laboratory Information Management System (LIS/LIMS) connection.

Sample traceability is maintained by barcodes on all source and destination tubes, and the workflows are standardized, making the platform ideal for laboratories handling clinical samples for analysis or archiving.

Tecan, www.tecan.com

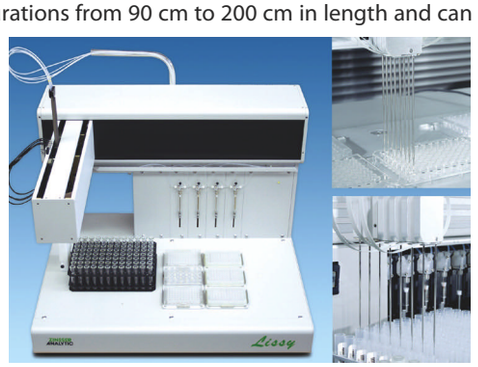
Pipetting robot for Serial Dilutions

Serial dilutions can be easily managed using Lissy, a pipetting robot. Its software organizes the pipetting steps and decides whether pre-dilution is required. The pipetting list can either be imported from an in-house Laboratory Information System (LIMS) system or from data entered into an Excel spreadsheet. For each sample processed, the dilution volume and the target positions are recorded in an export file.

The system can be used for multiple tasks (eg, switching from tubes to plates) by just changing the layout. It is available in various standard configurations from 90 cm to 200 cm in length and can accommodate various tubes, vials and microtitre plates on its workbench. Stackers can be added to increase capacity.

Lissy can be equipped with one up to 16 pipetting probes, with or without an integrated gripper for moving plates, individual tubes or tools. It can be further enhanced with modules such as sample identification (barcode reading), pH-measurement and adjustment, heating and cooling stations, vortexers and stirrers.

Zinsser Analytic, zinsser-analytic.com



Calendar of Events

2009

Apr 7 – 9, 2009
IBC's China 2009 Pharmaceutical R&D Summit
Shanghai, China
www.ibclifesciences.com/china/overview.xml

Apr 8, 2009
DNA Day
Dalian, China
www.bitlifesciences.com/dnaday/index.html

Apr 15 – 17, 2009
Bangalore Bio
Bangalore, India
www.bangalorebio.in

Apr 16-17, 2009
ISPE Japan Affiliate Annual Meeting Including PQLI
Tokyo, Japan
www.ispe.gr.jp/index.htm

Apr 21 - 23 2009
CPhI Japan 2009
Tokyo, Japan
www.cphijapan.com/eng/index.html

Apr 23 -25, 2009
PharmChina
Zhengzhou, China
www.pharmchina.com.cn

Apr 28 – 29, 2009
Antibody Engineering & Therapeutics Asia
Singapore
www.ibc-asia.com

Apr 28 – 30, 2009
Pharmaceutical Regulatory Affairs Asia
Singapore
www.abf-asia.com

May 12 – 14, 2009
API China
Xi'an, China
http://en.apichina.com.cn

May 31 – Jun 2, 2009
ISPE Singapore Conference
Singapore
www.ISPESingaporeConference.com/pa4

Jun 1 – 2, 2009
Interphex Asia
Karachi, Pakistan
www.biztradeshows.com/trade-events/interphex-asia.html

Jun 1 – 3, 2009
Drug Discovery & Development of Innovative Therapeutics Japan 2009
Tokyo, Japan
www.the-infoshop.com/conference/drugdisc-japan09

Jun 1 – 3, 2009
Biotech China
Shanghai, China
www.biotech-china.com/en/index.asp

Jun 8 – 11, 2009
World Vaccine Congress Asia 2009
Singapore
www.terrapinn.com/2009/wvcasia

Jun 17 - 20, 2009
PROPAK Asia 2009
Bangkok, Thailand
www.propakasia.com

Jun 22 – 24, 2009
World Congress of Cancer
Beijing, China
www.bitlifesciences.com/cancer2009

Jun 26 – 28, 2009
New Drugs China
Tianjin, China
www.en.newdrugschina.com

Jul 1 – 3, 2009
Interphex Japan 2009
Tokyo, Japan
www.interphex.jp

Jul 1 – 3, 2009
International Bio Forum & Bio Expo Japan
Tokyo, Japan
www.bio-expo.jp/english

July 18 – 25, 2009
World Summit of Antivirals
Beijing & Xi'an, China
www.bitlifesciences.com/wsa2009

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If you wish to get your event listed, please send the details to laura.low@rbi-asia.com

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www.ISPESingaporeConference.com/pa4

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Pharmaceutical or Biopharmaceutical manufacturing professionals specialising in one of the following areas:

- Automation & IT
- Production Engineering & Processes
- Project Management
- Quality Control & Assurance
- Facility / Plant Management
- Laboratory Management
- Regulatory Affairs & Compliance
- Validation
- Energy & Sustainability
- Contract Manufacturing

31May09 SUN

2 Pre-Conference Workshops

- Commissioning & Qualification
- Auditing for GMP

"Advancing Excellence and Innovation in Regional Pharmaceutical Manufacturing"

01Jun09 MON & 02Jun09 TUE

9 Industry Breakout Tracks

- Regulatory
- Sustainable Solutions
- Secondary Pharma Manufacturing
- Manufacturing Excellence
- Automation
- Contract Manufacturing
- PIC/S Regulatory Update for Emerging Markets ***Special Feature***
- Biopharma
- Validation: Hot Topics

03Jun09 WED

Pharmaceutical Facility Visits

- Abbott Laboratories ***New***
- Genentech ***New***
- GSK Jurong R&D Pilot Plant
- Lonza II Bulk Bio Facility ***New***
- Merck Sharpe & Dohme API & Tablet Plants
- Novartis Biomanufacturing Facility
- Pfizer API Manufacturing Plant
- Schering-Plough Singapore Facility

For more information and to register for the conference, please visit **www.ISPESingaporeConference.com/pa4**
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