

HTS Systems Reliability Trends 2010



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Executive Summary

- This market report summarizes the results of HTStec's vendor-independent global benchmarking study on HTS robotic assay system reliability carried out in September 2010.
- The survey was initiated by HTStec as part of its tracking of emerging life science marketplaces, with the aim of collecting opinion on the reliability of automated HTS assay systems and the effect of reliability on output. The objective was to try to understand the impact of reliability of HTS systems on the company's research enterprise as a whole and to see if it is possible to assign an economic value to the downtime of one of these HTS systems.
- The survey looked at the following aspects of HTS robotic assay systems (referred to as the 'system' in the report), as practiced today (2010) and in a few cases as predicted for the future (2013): system integrator; main components that make up the system; microplate holding capacity; microplate formats used; average number of screens run per year and data points generated per screen; level of operational throughput for biochemical and cell-based assays; time taken to deliver and install the system; aspects of reliability and performance considered and agreed with system integrator; size of the team responsible for system; proportion of screens run that are biochemical versus cell-based; average downtime per month; % operational time were the system functions at an acceptable level; breakdown of system downtime; expected downtime versus actual downtime; if the system can be accessed remotely; cause of most frequent system problems; cause of greatest system downtime; consequences of the system failing mid-run; uptime that might be gained with improved reliability; average % of data points generated of unacceptable quality; annual external spending on the system; estimated cost of unscheduled downtime or system failure; the cost of repeating unacceptable wells; how does reliability affect the perceived system value; realistic advantages of improved system reliability; what effects system failure; impact of system reliability on drug discovery; criteria by which HTS success is judged; what has HTS achieved to date; responsiveness and competence of HTS system integrators; whether the same system integrator would be chosen again for a new system; and what system integrators should do or change to improve system reliability.
- The main questionnaire consisted of 29 multi-choice questions and 4 open-ended questions. In addition, there were 6 questions related solely to survey demographics.
- The survey collected 60 validated responses, of these 53 (88%) provided comprehensive input.
- Responses were geographically split: 55% North America; 41% Europe; 2% Japan; and 2% Asia (Excluding Japan).
- Survey respondents were drawn from the key robotic system personnel; this included the supervisors, the operators, the owners and the engineers that support HTS robotic assay systems.
- Respondents were responsible for and reported on 35 Large Pharma systems; 10 Biotech systems; 8 Academic Screening Center systems; 4 Medium/Small Pharma systems; and 3 University/Research Institute/Not-for-Profit systems.
- Most survey respondents had a senior job role or position which was in descending order: 14 robotic system managers; 11 section/group leaders; 10 research scientists; 8 robotic system operators; 4 lab managers; 4 directors; 4 other job roles; 3 senior scientists/researchers; 1 principal investigator; and 1 vice president.
- Survey results were expressed as an average of all survey respondents. In addition, where appropriate the data was fully reanalyzed after sub-division into the following 5 survey groups: 1) Large Pharma; 2) Medium/Small Pharma & All Biotech; 3) Academic Screening Centers & Research Labs; 4) Europe; and 5) North America.
- The main activity of the most (80%) respondents was screening small molecules for drug discovery.
- Respondents were responsible for and reported on 10 Thermo Scientific systems; 8 Agilent Automation Solutions systems; 7 GNF Systems; and 6 HighRes Biosolutions systems. All other integrators were represented by 5 or less systems.
- Systems were made up of an average of 22 components, with hotels/stackers most abundant.
- The median system open and incubated microplate holding capacity were each 100-250 plates.
- Respondents reported they made greatest use of 1536-well plates on their system.
- A median of 10 primary screens per year were run on each system with 1M to 1.5M wells per screen.
- The median system operational throughput was 250K wells per week for a biochemical assay and 100K wells per week for a cell-based assay.
- A median of 6 months elapsed between contractual agreement and delivery of the system on site.
- A median of 2 months elapsed from delivery on site to site acceptance test (SAT) approval.

- Most respondents considered system reliability on specification and at acceptance (SAT), fewer included an acceptable system performance value into the contract with their system integrator.
- The typical system team was made up of a median of 3 FTE.
- A median of 45% of assays run on systems today (2010) were biochemical.
- The median system downtime (not operating for any reason) was 7 to 9 days per month.
- A median of 90% of the operational time the system functions was at an acceptable level.
- The majority of system downtime (i.e. time system was not being used for screening) was idle time.
- The expected median downtime (due to system malfunction) at the time of specification was 10%.
- The median actual downtime over the past year was 10%.
- Most respondents can access their system remotely (e.g. to restart a run that has stopped due to an error).
- Peripheral components hardware (e.g. readers, liquid handlers) was ranked as the cause of most frequent system problems and also the cause of greatest system downtime.
- A median of 2 additional day's operation per month or 1 additional primary screen per year was the uptime that might be gained if respondent's systems were more reliable.
- A median of 5% of data points generated were excluded due to an unacceptable level of quality.
- Over the past year a median of \$25K-\$50K was spent on service contracts on the system.
- The cost of unscheduled downtime or system failure was estimated to be a median of \$1K-\$2.5K per 24h of lost operation. However 44% of respondents did not know, had not considered or were not able to assign a cost to their lost downtime.
- \$2.5K-\$5K was estimated to be the median cost of repeating the unacceptable wells per screen.
- Increased user satisfaction was rated as the most likely advantage of improved system reliability.
- The introduction of a new assay readout/technology was rated as having the greatest positive effect on the failure rate of a system and reagent characteristics (e.g. viscosity, homogeneity, surface tension) was rated as having the greatest negative effect on the failure of a system.
- The majority of respondents believed system reliability to have a minor effect on an organization's drug discovery success.
- More data points screened was rated the greatest achievement of HTS.
- System integrators demonstrated greatest responsiveness and competence with respect to integration hardware (e.g. robots, plate handlers and movers).
- ¼ of respondents would not choose the same system integrator again, mainly due to reliability issues.
- A reliability index was developed to compare the performance of the 56 integrated systems reported in detail. The index was based on several parameters related to system reliability that were collected in the survey. The Reliability Index (RI) = \sum (% operation at an unacceptable level + % actual downtime + % data points excluded). The lower the index (% value) the more reliable the system was. Based on this simple calculation the industry average for all 56 systems reported was an RI = 45% (made of 18% operation at an unacceptable level, 18% actual downtime, and 9% of data points excluded). Of those integrators where at least 5 systems were reported GNF systems had the lowest RI (=23%) and was by this index the most reliable of the systems surveyed.
- Respondent's open-ended feedback was documented to the following questions: 1) the consequences of a system failing mid-run (i.e. not being able to complete a run) or of the system being unexpectedly incapable of starting a run; 2) how reliability of a respondent's system affects the perceived value of their system; 3) by what success criteria HTS is assessed or judged in respondent's organization; and 4) what respondents would like system integrators to do or change to improve system reliability.
- The full report provides the data and the mean values, details of the breakdown of the responses for each question, its segmentation and a few estimates for the future (2013). It also highlights some interesting differences, particularly between survey groups Medium/Small Pharma & All Biotech and North America versus survey groups Academic Screening Centers & Research Labs and Europe.
- PLEASE NOTE in this market report an 'HTS system' had robotically integrated capabilities for: 1) reagent/liquid dispensing into assay plates; 2) assay plate incubation or holding; and 3) assay plate reading. Systems reported had a minimum on board storage capacity of at least 150 assay plates and were able to process (screen) plates at a rate of at least 10,000 wells per 24h day. Assay workstations and other automated systems that primarily reformat compounds or create assay ready plates were excluded and are not analyzed in this report.

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General Information on HTStec and HTStec's Trends Market Reports

- HTStec Limited an independent market research consultancy founded in September 2003 whose focus is on assisting clients delivering novel enabling platform technologies (liquid handling, laboratory automation, detection instrumentation and assay reagent technologies) to drug discovery. Over the past 7 years HTStec has published more than 50 market reports on drug discovery technologies and authored over 30 review articles in Drug Discovery World.
- HTStec's Trends reports owe their origins to the need by developers and vendors of new enabling technologies in drug discovery to get up-to-date relevant market metrics on which to base informed business decisions.
- Typically focused on a specific market niche or segment, in many cases overlooked or frequently misunderstood by broader market studies.
- Investigations are mainly initiated in response to a sponsor's specific requests.
- HTStec's extensive experience of the market, both as a Pharma End-User and working for a major Life Science Tool Provider ensures the industry relevance of the market research collected.
- Based entirely on web-based feedback from potential customers drawn mainly from Pharma and Biotech, although increasingly University and Research Institute labs are also being researched.
- Produced extremely rapidly and typically published within 3 weeks of starting the collection phase.
- Reports are short, concise and focused on giving readers the basic data, analyzed in several different ways.
- Limited to reporting the main findings alone, without exhaustive discussion on the relevance of the results.
- Market estimates are mainly based on bottom-up calculations and usually avoid attempts to forecast widely beyond the next 2-3 years. Full details on the derivation of market estimates are given so readers can apply their own factors and easily make alternative estimates if they prefer.
- Owing to the sensitivity of some of the data collected, all reference to the origin of participating companies is removed, data is pooled to get an industry average and the anonymity of all respondents fully preserved and guaranteed.
- Critically HTStec's Trends reports have generated much interest and acclaim amongst survey respondents, to whom they are made available free of charge (subject to acceptance of HTStec's copyright terms) so they can benchmark their internal processes.
- Unlike alternatives HTStec's Market Surveys and Report are aimed at giving readers, information they want and can rely on, not information they don't need, cannot easily discern or is of dubious authenticity.
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