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Why Choose the MA-3000 Direct Mercury Analyzer?

1) The Model MA-3000 Direct Mercury Analyzer from Nippon Instruments Corporation (NIC) has the **lowest detection limit and practical quantitation limit** available for a direct (combustion) mercury analyzer.

    - Method Detection Limit (MDL) is less than 0.001ng (less than 1pg) and the "Real-World" Practical Quantitation Limit is approximately 0.01 to 0.02ng (10-20pg). For a 200-mg sample, this would equate to about 50-100 parts per trillion. These are the lowest such limits available in a commercially available direct mercury analyzer.

    - What specifically makes the MA-3000 so sensitive?

        - Light Source: We use a very high quality Hg-discharge lamp that emits a very strong line emission at 253.7nm. This eliminates the need for any optical filtering to limit the light source to the 253.7nm wavelength used for maximum absorbance by elemental mercury. Optical filters reduce the intensity of the light source that is available to pass through the absorbance cell, which is why we don't use them. In addition, the lamp is maintained at a consistent temperature through the use of a heater jacket around the lamp. This keeps the output from the lamp very consistent over time and also protects against ambient temperature fluctuations.

        - Optical Path: In order to maintain the advantages obtained by using a high intensity light source, we must also be able to direct that light source through both of our absorption cells and to all three detectors (long cell detector, short cell detector, and reference detector) without losing that intensity. Other systems use inexpensive 50% transmittance mirrors to redirect the light source, but this reduces the intensity of your light source by 50%. Instead, we use high quality optical gratings that will redirect the full intensity of the light source to each of our three detectors.

        - Detectors: As noted above, we use three independent detectors in the MA-3000. One reference detector to further stabilize the background from the light source, and then an independent detector for each of the absorption cells. We use wavelength specific photo tubes for our detectors, which don't require any wavelength filtering and also have a peak intensity of measurement at 253.7nm.

2) The MA-3000 has the **widest linear range and widest overall dynamic range** available in a direct mercury analyzer.

    - Linear Range up to 2,000ng Hg and the Maximum Dynamic Range up to 70,000 ng Hg

    - How is the linear range so wide?

        - With the use of our dual-cell, tri-detector optics, the linear range is split between the long cell (up to 10ng) and the short cell (over 10ng). Every

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calibration standard and sample is always measured on both cells, and the results for both cells are tabulated in the sequence table. The software will automatically select the appropriate measurement to report based on the 10ng split. There are two calibration curves, one for each absorbance cell, that are generated, and the software automatically selects the appropriate range to apply these measurements to during calibration. We commonly use 10ng as a calibration point for both cells, and the results for samples just above and below 10ng are typically within no more than 2% deviation from one cell to the other. The ability to split the range using the dual-cell, tri-detector optics allows for a seamless linear range all the way up to 2,000ng Hg.

- The user always has the ability to override the software's automatic selection for each individual sample measurement. For example, if a sample is measured at 10.1ng, the software will choose the short cell (high range) measurement automatically. As the user, you may decide you prefer the short cell (low range) measurement, and you can simply make that change using a drop-down selection in the table for that one measurement.

3) The MA-3000 Software is **packed with features** and is very **user-friendly**.

   - List of Top Software Features:

     - The MA-3000 software works in all recent versions of Windows (XP, 7, 8, and 10). The software is very easy to use and includes flow-path animation that keeps the user informed of the current status throughout each measurement.

     - The sequence table is Excel-based and allows for simple functions such as cut/copy/paste. With a simple right-click to the sequence table, you can save the data as a CSV file for direct importation into LIMS.

     - The software has an Auto-Blanking function that will automatically add a blank measurement after any sample measurement that exceeds a user-defined limit. This blank measurement is then repeated until the measurement is below a user-defined value. This ensures that your samples are not biased by over-range samples during a run, which further enhances the level of automation offered by the MA-3000.

     - The software also continuously monitors key diagnostics, such as all heater temps, flow rates, valve actuations, and voltages. This allows the software to automatically prompt the user if there is an issue with the system, and it also allows us quick and easy troubleshooting. You can read a full display of voltages to us over the phone, and we can typically know the cause of any issues right away.

     - Measurement counts and lamp hours for the life of the instrument are tracked and monitored. The software will then notify the user when it is nearing time to replace key items such as the catalyst tube, gold trap, or lamp. This early warning ensures that you can get replacements ordered in advance.

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4) The MA-3000 is very **cost-Effective and dependable**.

- What makes the MA-3000 Cost-Effective?
  - Superior Catalyst: The MA-3000 catalyst typically lasts 3-4 times longer than those offered by other manufacturers. Since the catalyst is usually the most expensive consumable item in a direct mercury analyzer, this greatly reduces operational costs over time. The MA-3000 includes two catalyst tubes upon delivery, which means that you will have no replacement cost for 1.5 to 2 years.
  - Superior Gold Amalgamator: The MA-3000 Gold Amalgamator (gold trap) rarely needs to be replaced. The proprietary materials used by NIC make it a very robust, long-lasting gold trap. Since the MA-3000 also includes two gold traps, there will be no cost for replacement of the gold trap for many years.
  - Fewer Consumables: Our ceramic sample boats can be used for both liquids and solids, and they last many years before needing to be replaced. Others use nickel or quartz boats. The nickel boats are not good for liquids, and they decay rapidly. The quartz boats are very expensive (about 3X our ceramic boats) and more easily broken.
- What makes the MA-3000 so Durable?
  - Superior Catalyst and Gold Amalgamator: When catalysts and gold amalgamators (gold traps) in other systems must be replaced every few months, this also means that there is a noticeable degradation in performance of these components that then ultimately leads to them being replaced. Other such manufacturers will have the user "bump" the calibration curve with a check standard as this degradation occurs. With the MA-3000 catalyst and gold trap having such long lifetimes and superior designs, we never ask our users to "bump" the calibration curve. The calibration curve generated for each catalyst will typically continue the same level of response right up until it must be replaced 9-12 months later. This is verified with check standards, but with the MA-3000 there is never a need to essentially "fudge" the calibration curve in order to compensate for degrading performance.
  - Other Hardware: We use a high quality mass flow controller for our carrier gas, and we use very long-life components throughout the system. The entire flow path is heated with the lowest temperature being 150C in the absorption cells. This protects against any moisture or contamination, and it also allows the MA-3000 to make very high (ppm) measurements and quickly reduce background for very low (sub-ppb) measurements.

In summary, better optics, better detectors, better components, and a better design, that is produced and supported by **Nippon Instruments Corporation** that started their business with direct combustion mercury analyzers back in the 1970's. We have many years of experience as a company strictly **dedicated to mercury analysis**.