Selecting A System

11.0 Steps To Selecting A Gas Detection System

This section describes the steps to follow to evaluate a gas monitoring application, and to select the best system for the application. The first 4 steps pertain to filling out the applications survey sheets. The remaining steps assist you in evaluating the information, making the equipment selection, and considering any other options or equipment that you may need.

11.1 Define The Problem: Which Gases Need to be Detected And at What Range?

List the gas or gases that you need to detect (the "target" gas or gases), and over what ranges you need to detect them. What is the reason for detecting these gases? Is it to prevent explosion? To prevent asphyxiation? To prevent employee exposure to potentially toxic gases or vapors? To control a process? At what gas levels do you wish to take action, and what is the action that needs to be taken?

11.2 Define The Area to be Monitored:

The area to be monitored must be examined carefully and the questions on the applications survey must be carefully considered and answered. This will assist you and RKI Systems Applications Engineers to make the most informed selection of the proper equipment to solve your gas monitoring application. What is the classification of the area? Do the sensors need to be explosionproof? Intrinsically safe? Weather resistant? Corrosion resistant?

11.3 Define The Area The Controller Will be Installed, And What Action The Controller Must Take:

The site where the controller will be installed must be carefully considered, and the questions regarding this area answered on the applications survey. Also consider what action or information you will expect the controller to provide to you, if any, and if you might possibly need to expand the system in the future. This will help you and RKI to select the most appropriate controller for your needs.

11.4 How to Determine The Quantity of Sensors Needed And Sensor Placement:

Please consider the guidelines below, and draw your proposed sensor locations on the Applications Worksheet sketch graph paper. Fax it to RKI for review or assistance.

11.4.1 How much area can one sensor cover?

Consider that a sensor operates similarly to a person's nose. A nose can only sense what is immediately surrounding it. If there is a skunk 10 feet away, but with a strong wind blowing the smell away from you, you may not smell the skunk, or at least not smell it very strongly. On the other hand, if you are downwind of the skunk, even 100 feet away, you likely will smell it. If you are indoors with the skunk, the vapors can travel quite a distance to cover the entire room. Depending on ventilation patterns, the smell may be worse in some areas than others.

Gases behave much the same as the skunk odor. The key is to locate the sensors as close as practical to the likely leak source or sources. If the gas could come from almost anywhere in a building, such as for CO monitoring in a parking garage, then it is necessary to spread sensors around the entire garage to get full coverage. In another example, if you are monitoring a 100' by 100' room for flammables, but the only possible source of flammables is a tank in one corner, then it is necessary to monitor the tank in the corner but not necessarily other areas of the room.

11.4.2 Sensor spacing for indoor applications

For applications where the gases could exist anywhere in the facility, a decision must be made how far apart to place the sensors and how many sensors should be used. There is no fixed answer to this that is correct for all applications, but an industry guideline is to space the sensors approximately 40 to 50 feet apart for indoor applications. Your decision must be based on your careful evaluation of the

hazard from the gases, and an assessment of the ventilation patterns inside the facility. Practicality and cost must also be considered. For example, if monitoring a 1 mile tunnel for CO levels, it would be considered excessive to place sensors every 50 feet, and a much wider spacing would likely be used. For typical indoor applications though, the 40 to 50 foot guideline is a good starting point. If spacing the sensors 50 feet apart, then you would also space the sensors 25 feet away from the wall. Using the sketch of the area to be monitored in the Applications Worksheet, mark the proposed sensor locations by spacing them an appropriate amount apart.

11.4.3 Sensor spacing for outdoor applications

Outdoor applications will be very susceptible to wind conditions, and good coverage of a point source leak, such as a propane tank or valves, cannot be done with just one sensor. If the tank or valves cannot be enclosed or shrouded somehow, then sensors should be placed as close as practical to the possible leak source, and multiple sensors should be used to provide good coverage for all typical wind directions. If monitoring a valve jungle, for example, it may be possible to place a shroud covering the valves, and then monitor inside the shroud with just one sensor. The shroud will help to shield the vapors from the wind and help to contain them for detection.

In open air monitoring outdoors where the vapors could be coming from many sources or directions, such as a refinery, then the decision of how many sensors are needed can be made similarly to the indoor guidelines given above, except that a closer spacing of 30 to 40 feet between sensors is recommended. In all cases, sensor count can be reduced if the possible leak sources are known and the sensors can be concentrated closer to the leaks.

11.4.4 Other considerations or guidelines

In deciding sensor count and location, please consider the following:

11.4.4.1 Locate sensors strategically so they will be in the most likely path of a gas leak. Carefully evaluate possible leak sources and ventilation flow of the area to be monitored.

11.4.4.2 Consider the density of the gas. Gases that are lighter than air will rise, so sensors for these should be located near the ceiling . Heavier than air gases or vapors will tend to remain near the floor so sensors for these should be located near the floor.

11.4.4.3 Flash Point : Consider that flammable substances with high flash points (higher than typical normal room temperature of 60 to 70 degrees F) will not have much vapor present if the surrounding area is cold. Liquids with high flash points are not capable of producing a flammable level of vapor at cold temperatures, unless the liquid is heated. Sensors must be located as close as possible to the leak source of these liquids in order to detect them.

11.4.4.4 Temperature: Consider the temperature of the area to be monitored. Gas detection sensors have certain temperature limits that cannot be exceeded. If the area is too hot for the sensor, you should consider using a sample drawing type sensor to allow the sample to cool before being exposed to the sensor. If the hot vapors being monitored have a flash point temperature higher than the ambient conditions, then the sample cannot be cooled below this or condensation of the vapors will occur in the sample tubing. In this sort of application, please consult the factory for another solution such as a heated sampling system or other device.

11.4.4.5 Wet areas: If the area is wet, please take care to select sensors (and controllers) that are intended for wet areas. Install sensors facing downward so they can shed the water or rain. If using a sample draw system, install appropriate water traps or hydrophobic filters. If possible, install detectors where exposure to splashing will be minimized.

If monitoring a trench that could periodically get filled with water, mount the detector high enough in the trench so that it cannot get flooded. If this is not possible, consider use of a sample draw head with a floating sample inlet, or some other technique to handle the water.

11.4.4.6 Vibration: Install detectors where they will be free from vibration. Heavy or constant vibration can shorten the life of a sensor.

11.4.4.7 Dust or dirty areas: If area to be monitored is especially dirty or dusty, select sensors or filters that will prevent the dust or dirt from clogging the sensor. Consult RKI for assistance with these areas.

11.4.4.8 Maintenance: When selecting sensor locations, keep in mind that sensors must be accessible for maintenance. Do not install in difficult to reach areas. If this is not possible, then consider use of a sample draw detector head, so that the sample tube only is run to the inaccessible area, and the sensor can be located in an easy access location.

11.4.4.9 For location of toxic gas sensors to protect workers, consider the location of the workers in relation to the source of the toxic gases. Locate the sensors between these two to provide an early warning of rising gas levels.

11.4.4.10 Physical protection: Do not install sensors where they may be physically hit or abused, blocked by mud or other debris, painted over, or subject to steam or hosing down.

11.5 Define What Type of System is Needed:

Using the information provided in Sections 1 through 4 above on the applications survey, you are now ready to define what type of system is needed. Most of the definition will be obvious from the applications survey. You now must define the following:

11.5.1 Sensor / Transmitter Questions:
How many sensors are needed for each gas type?
Sample draw or diffusion sensors?
Is sample conditioning necessary, and if so what type of conditioning?
Select the most appropriate sensor technology
Is a local readout or local relays a requirement?
Are non intrusive calibration heads a requirement?

11.5.2 Controller Questions:
Is a central controller necessary?
Wall mounting or rack mounting controller?
How many alarm points are needed?
Are relays needed for the alarm points? If so what amperage is needed?
What action is intended to take place if an alarm occurs and how will that action happen?

11.6 How to Select the Proper System For Your Use:

Now that you have defined the number of points, the sensor and controller locations, and what the system needs to do, you can select the proper sensors and controller for your application.

11.6.1 Select the proper sensor/transmitter type from the RKI Product Overview section of this manual. Select by gas type, and by environmental conditions (for example whether the sensor needs to be explosion-proof or not). If you cannot find one that suits your needs, please contact RKI for assistance.

11.6.2 Once you have determined how many detection points are required, you can select the appropriate controller for your use. Select the controller from the RKI Product Overview of this manual, or from the "Product Selection Chart" at the end of this section. If you are anticipating expansion in the future, you may want to select a controller that has capability of adding a few points. Other things to consider are the number and location of the controllers. For example, if you need 8 points of detection, but their locations are spread throughout the plant, you might wish to consider using two 4 point controllers located at different ends of the plant to save on wiring costs. (If you need all the readouts at one location, then you would not consider two four point controllers).

Another thing to consider in selecting the controller is what action is required from the controller. If you need alarm levels, relays, or 4-20 mA output terminals, then select a controller that provides these functions.

Finally, consider the environmental conditions at the controller location(s). Select a controller that meets these conditions.

11.6.3 Discuss application with RKI: Consult RKI Applications Engineering to review the application and the sensor and controller selection.

11.7 Product Selection Charts

As a useful guide to help you select the most appropriate system for your use, this section includes selection charts describing the appropriate controller possibilities based on the number of sensors needed.

To use the following charts, first decide how many sensors are needed, considering possible future expansion, and then turn to the selection chart for that number of sensing heads. The charts provide a condensed description of features for each unit, to aid you in selecting the one which best suits your application

11.8 Other Considerations:

Are there any special conditions or additional equipment that need to be taken care of? Please consider these now. Some examples of this may be the following:

11.8.1 Calibration Kit:

It is recommended that all systems be calibrated when first installed, and then at a minimum of 3 to 6 month intervals thereafter. RKI can supply a calibration kit for most systems. A calibration kit normally consists of cylinder(s) of appropriate calibration gas, a valve or regulator, tubing, and a test cup to apply the gas to the sensor. It is generally recommended that you purchase a calibration kit with your system. Since there are numerous combinations of systems and gases, please consult RKI for selection of the appropriate Calibration Kit for your use.

11.8.2 Battery Backup:

Some critical applications require a battery backup system, or a UPS (Uninterruptible Power Supply) for their gas monitor. If you need this, it can be provided by RKI or it can be purchased from some other source. UPS systems for computers are readily available from many sources and are reasonably priced. RKI offers a battery backup (1.2 Amp Hours and 12 Amp Hours) in a NEMA 4X enclosures that can also be used. Battery backups are generally connected to the 12VDC or 24 VDC input power terminals on the controllers. A UPS system is normally connected to the 115 VAC terminals on the controller. In either case, the backup power automatically takes over should the primary power fail to the unit.

If you need backup power, please consider how long you need the backup to operate the system, and what peripherals you want the backup to also operate, if any, such as horns or lights. Contact RKI with this information for assistance selecting an appropriate backup.

11.8.3 Remote horns or lights:

Most RKI Controllers have an audible alarm and alarm LED's as part of the controller. In some cases it is desired to also have a remote or louder audible alarm or alarm light. RKI can supply a variety of remote horns or lights for warning of personnel to a gas alarm situation. The most common of these are as follows:

11.8.3.1 Red Rotating Beacon:

This beacon is powered by 115 VAC or 24 VDC, and is effective at attracting attention even in noisy or outdoor areas. Two are offered by RKI, 51-0055RK 115 VAC red rotating Beacon, and 51-0066RK 24 VDC red strobe light.

11.8.3.2 AC Vibratory Horn:

This is a very loud and obnoxious vibratory horn (100db at 10 feet) for use in outdoor areas, high noise areas, or other areas where an unmistakable noisemaker is desired. This horn is RKI Part number 52-0002RK. A 24 VDC vibrating horn is also available, part number 52-0004RK.

11.9 Custom Systems:

RKI has many other systems, sensors, and solutions to gas monitoring applications. We also can design custom systems if one of our standard ones will not do the job. Please feel free to contact RKI Systems Applications Engineering at (800) 754-5165 to discuss your application.

11.10 Ordering The System:

Now that the system selection has been made, you may order the system in one of several ways. For current pricing, please contact RKI, the RKI distributor in your area, or the RKI Rep for your area. If you have any question who to contact, please contact RKI.

11.10.1 Distribution:

RKI has a distribution network for our products in most areas. If there is an active RKI Fixed System Distributor in your area, and you have received this manual from one of them, then your order should also be placed with them.

11.10.2 RKI direct:

If there is no active RKI Fixed Systems Distributor or Rep in your area, then you should contact RKI at (800) 754-5165 (or Fax RKI at (510) 441-5650) to place your order.

11.10.3 RKI also has regional factory representatives that provide technical assistance to our distributors and customers to help with the selection of the proper equipment. Orders may be placed with the factory representatives for forwarding to RKI or may be sent directly to RKI instead.

11.0 Steps To Selecting A Gas Detection System

11.11 Taking Delivery of The System:

11.11.1 Installation of the system:

System should be installed by a qualified electrician technician, and in conformance with all local building codes, electrical codes, and fire codes. Follow the installation instructions provided in the instruction manual for wiring information, and system operation. Take care to make connections to the proper terminals, and do not apply power to the system until all wiring is completed.

11.11.2 Startup of the system:

Once power is applied, allow the system to warm up, and then check the system for proper operation of gas sensors and alarms. Confirm operation of all peripheral devices such as fans or horns. Confirm calibration of the system with use of a calibration gas source. Calibration gases are available from RKI. If you require assistance with startup of the system, RKI can provide field service for startup and training at reasonable prices, from either the factory direct, or from one of our service centers, distributors, or field reps. Please contact RKI Instruments Field Service at (800) 754-5165.

11.11.3 Maintaining the system:

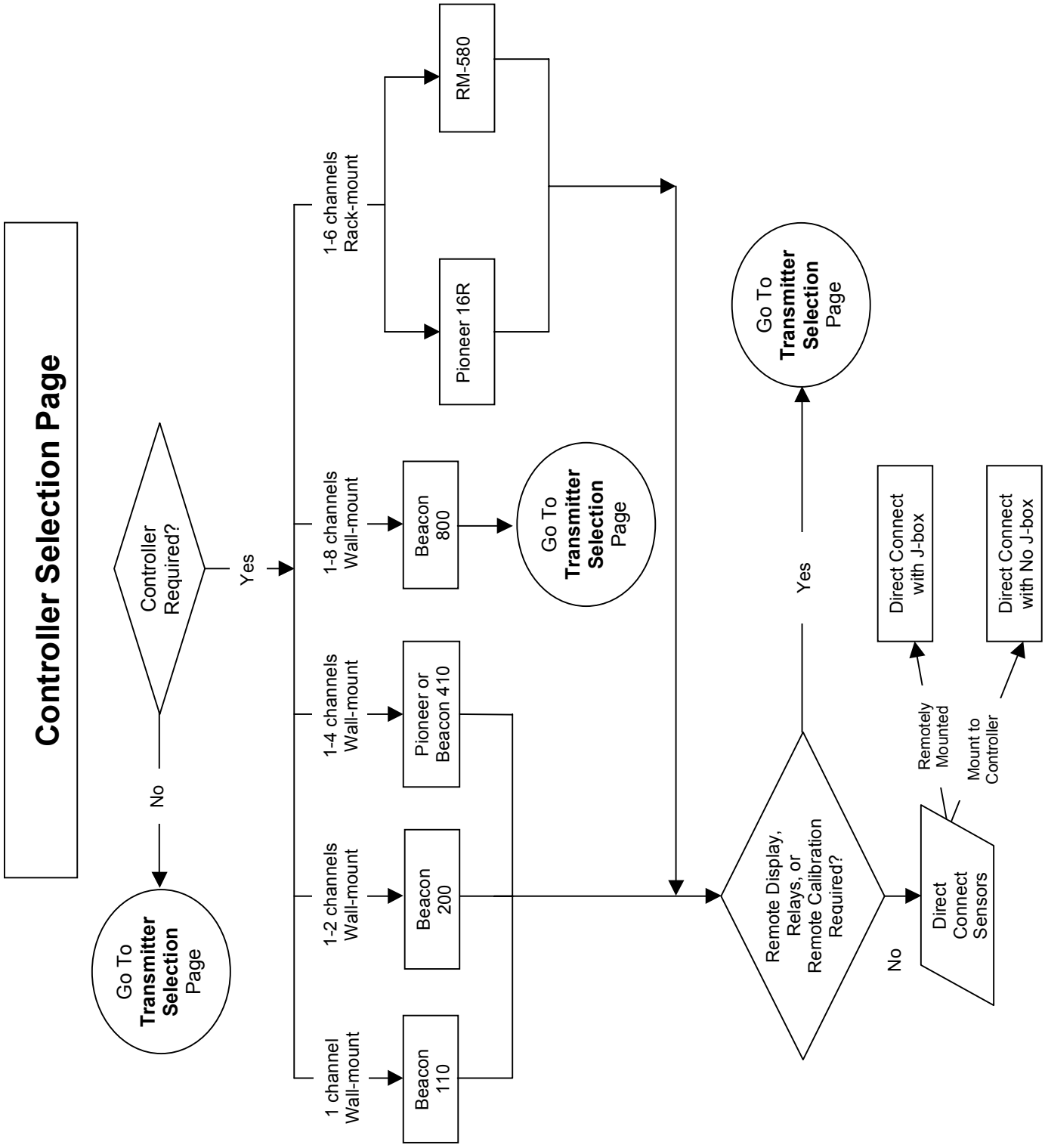
Once the system is installed and operating, it is very important to service and maintain the system. The system must be calibrated periodically. The necessary frequency of calibration varies from application to application, and needs to be determined from actual use. In benign applications where the sensor will encounter gas very infrequently, the sensors will likely hold up better than in corrosive or wet environments or areas where frequent or high exposures are common. Typically, calibrations can be done on 3 to 6 month intervals, but some applications may require it more frequently. Calibration can be performed either by your own trained personnel, or RKI can provide routine calibration and maintenance service at reasonable cost.

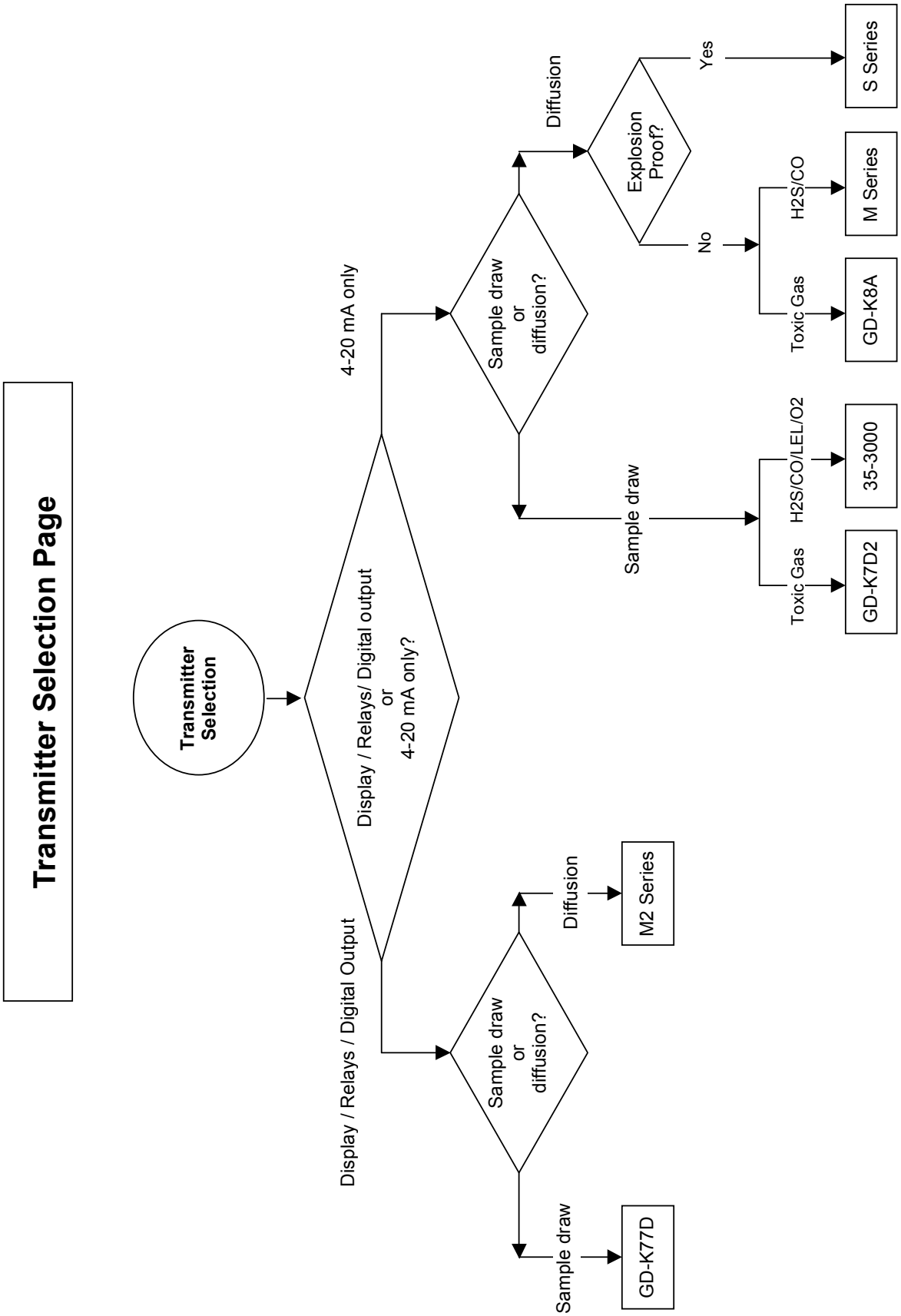
Other than routine calibration, some systems may also require periodic filter replacement, pump replacement, or replacement of other expendable parts such as batteries or absorbent cartridges. Please follow the recommendations in the instruction manual.

Most sensors will respond to families of gases, such as flammables, or acid gases, or hydrides, that have a chemistry that behaves similarly on the sensor. In addition, they may respond to other gases that are outside the intended family of gases, and may be considered as an “Interfering Gas”. Careful evaluation of a detection area or sample stream must be done to determine if there will be any other gases present besides the one(s) that you wish to detect, and if these other gases may cause an unwanted signal on the sensor.

Interference charts for several of RKI’s most common sensor types appear on the following pages. These charts show the sensor type, the gas the sensor was calibrated to, the “interference” gas and concentration applied, and the response obtained, if any. Examination of these charts can be very useful in determining if a particular sensor type will perform adequately in a given application.

11.12 Product Selection Flow Chart:




Transmitter Selection Page
Transmitter Selection
Display / Relays/ Digital output or 4-20 mA only?
4-20 mA only
Sample draw or diffusion?
Diffusion
Explosion Proof?
Yes
S Series
No
H2S/CO
M Series
Toxic Gas
GD-K8A
Sample draw
H2S/CO/LEL/O2
35-3000
Toxic Gas
GD-K7D2
Display / Relays / Digital Output
Sample draw or diffusion?
Diffusion
M2 Series
Sample draw
GD-K77D