

What is claimed is:

1. A vibratory meter (5) comprising one or more flow conduits (103), one or more pickoff sensors (105, 105') affixed to the one or more flow conduits (103), and a driver (104) configured to vibrate the one or more flow conduits (103), with the vibratory meter (5) being characterized by:
 - meter electronics (20) coupled to the one or more pickoff sensors (105, 105') and to the driver (104), with the meter electronics (20) being configured to vibrate the one or more flow conduits (103) of the vibratory meter (5) using a drive signal including an initial vibration frequency and to receive a pickoff sensor signal from the one or more pickoff sensors (105, 105') in response, iteratively offset a phase difference between the drive signal and the pickoff sensor signal by a predetermined phase increment and measure a resulting vibrational frequency and amplitude, with the offsetting operatively sweeping the vibration frequency over a predetermined vibration frequency range and therefore generating a plurality of vibration amplitudes and a corresponding plurality of vibration frequencies, and determine a substantially maximum amplitude response in the plurality of vibration amplitudes and designate the corresponding vibration frequency as comprising the resonant frequency.
2. The vibratory meter (5) of claim 1, with the meter electronics (20) being further configured to measure the resulting vibrational frequency and the resulting vibrational amplitude after a predetermined settling period from the offsetting.
3. The vibratory meter (5) of claim 1, with the drive signal including a substantially constant amplitude.
4. The vibratory meter (5) of claim 1, with the vibratory meter (5) comprising a vibrating densitometer, a vibrating gas densitometer, or a Coriolis mass flow meter.

5. The vibratory meter (5) of claim 1, with the meter electronics (20) being further configured to use the resonant frequency to generate one or more flow material quantifications.

5 6. The vibratory meter (5) of claim 1, wherein the predetermined vibration frequency range is selected to include a presumed resonant frequency.

7. The vibratory meter (5) of claim 1, with the meter electronics (20) being further configured to narrow the predetermined vibration frequency range to a predetermined
10 narrowed frequency range after the resonant frequency is found, wherein the offsetting and determining is repeated in order to locate the resonant frequency within the predetermined narrowed frequency range.

8. The vibratory meter (5) of claim 1, with the meter electronics (20) being further
15 configured to narrow the predetermined vibration frequency range to a predetermined narrowed frequency range after the resonant frequency is found, with the predetermined narrowed frequency range being substantially centered on the found resonant frequency and the offsetting and determining is repeated in order to locate the resonant frequency within the predetermined narrowed frequency range.

20 9. The vibratory meter (5) of claim 1, with the meter electronics (20) being further configured to widen the predetermined vibration frequency range to a predetermined widened frequency range if the resonant frequency is not found, wherein the offsetting and determining is repeated in order to locate the resonant frequency within the
25 predetermined widened frequency range.

10. The vibratory meter (5) of claim 1, wherein the resonant frequency can be determined for one or both of a particular vibratory meter or a particular flow material.

11. A method of determining resonant frequency in a vibratory meter, with the method including vibrating one or more flow conduits of the vibratory meter using a drive signal including an initial vibration frequency and receiving a pickoff sensor signal in response, with the method being characterized by:

5 iteratively offsetting a phase difference between the drive signal and the pickoff sensor signal by a predetermined phase increment and measuring a resulting vibrational frequency and amplitude, with the offsetting operatively sweeping the vibration frequency over a predetermined vibration frequency range and therefore generating a plurality of vibration
10 amplitudes and a corresponding plurality of vibration frequencies; and determining a substantially maximum amplitude response in the plurality of vibration amplitudes and designating the corresponding vibration frequency as comprising the resonant frequency.

15 12. The method of claim 11, with the method further comprising measuring the resulting vibrational frequency and the resulting vibrational amplitude after a predetermined settling period from the offsetting.

20 13. The method of claim 11, with the drive signal including a substantially constant amplitude.

14. The method of claim 11, with the vibratory meter comprising a vibrating densitometer, a vibrating gas densitometer, or a Coriolis mass flow meter.

25 15. The method of claim 11, with the method further comprising using the resonant frequency to generate one or more flow material quantifications.

16. The method of claim 11, wherein the predetermined vibration frequency range is selected to include a presumed resonant frequency.

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17. The method of claim 11, wherein the predetermined vibration frequency range is narrowed to a predetermined narrowed frequency range after the resonant frequency is found, wherein the offsetting and determining is repeated in order to locate the resonant frequency within the predetermined narrowed frequency range.

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18. The method of claim 11, wherein the predetermined vibration frequency range is narrowed to a predetermined narrowed frequency range after the resonant frequency is found, wherein the predetermined narrowed frequency range is substantially centered on the found resonant frequency and wherein the offsetting and determining is repeated in order to locate the resonant frequency within the predetermined narrowed frequency range.

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19. The method of claim 11, wherein the predetermined vibration frequency range is widened to a predetermined widened frequency range if the resonant frequency is not found, wherein the offsetting and determining is repeated in order to locate the resonant frequency within the predetermined widened frequency range.

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20. The method of claim 11, wherein the resonant frequency can be determined for one or both of a particular vibratory meter or a particular flow material.

What is claimed is:

1. A vibratory meter comprising one or more flow conduits, one or more pickoff sensors affixed to the one or more flow conduits, and a driver configured to vibrate the one or more flow conduits, with the vibratory meter being characterized by:

5 meter electronics coupled to the one or more pickoff sensors and to the driver, with the meter electronics being configured to vibrate the one or more flow conduits of the vibratory meter using a drive signal including a substantially constant amplitude and an initial vibration frequency and to receive a pickoff sensor signal from the one or more pickoff sensors in response, iteratively offset a phase difference between the drive signal and the pickoff sensor signal by a predetermined phase increment and measure a resulting vibrational frequency and amplitude, with the offsetting operatively sweeping the vibration frequency over a predetermined vibration frequency range and therefore generating a plurality of vibration amplitudes and a corresponding plurality of vibration frequencies, and determine a substantially maximum amplitude response in the plurality of vibration amplitudes and designate the corresponding vibration frequency as comprising the resonant frequency.

20 2. The vibratory meter of claim 1, with the meter electronics being further configured to measure the resulting vibrational frequency and the resulting vibrational amplitude after a predetermined settling period from the offsetting.

3. The vibratory meter of claim 1, with the vibratory meter comprising a vibrating densitometer, a vibrating gas densitometer, or a Coriolis mass flow meter.

4. The vibratory meter of claim 1, with the meter electronics being further configured to use the resonant frequency to generate one or more flow material quantifications.

30 5. The vibratory meter of claim 1, wherein the predetermined vibration frequency range is selected to include a presumed resonant frequency.

6. The vibratory meter of claim 1, with the meter electronics being further configured to narrow the predetermined vibration frequency range to a predetermined narrowed frequency range after the resonant frequency is found, wherein the offsetting and determining is repeated in order to locate the resonant frequency within the predetermined narrowed frequency range.

7. The vibratory meter of claim 1, with the meter electronics being further configured to narrow the predetermined vibration frequency range to a predetermined narrowed frequency range after the resonant frequency is found, with the predetermined narrowed frequency range being substantially centered on the found resonant frequency and the offsetting and determining is repeated in order to locate the resonant frequency within the predetermined narrowed frequency range.

8. The vibratory meter of claim 1, with the meter electronics being further configured to widen the predetermined vibration frequency range to a predetermined widened frequency range if the resonant frequency is not found, wherein the offsetting and determining is repeated in order to locate the resonant frequency within the predetermined widened frequency range.

9. The vibratory meter of claim 1, wherein the resonant frequency can be determined for one or both of a particular vibratory meter or a particular flow material.

10. A method of determining resonant frequency in a vibratory meter, with the method including vibrating one or more flow conduits of the vibratory meter using a drive signal including a substantially constant amplitude and an initial vibration frequency and receiving a pickoff sensor signal in response, with the method being characterized by:

iteratively offsetting a phase difference between the drive signal and the pickoff sensor signal by a predetermined phase increment and measuring a resulting vibrational frequency and amplitude, with the offsetting operatively sweeping the vibration frequency over a predetermined

vibration frequency range and therefore generating a plurality of vibration amplitudes and a corresponding plurality of vibration frequencies; and determining a substantially maximum amplitude response in the plurality of vibration amplitudes and designating the corresponding vibration frequency as comprising the resonant frequency.

11. The method of claim 10, with the method further comprising measuring the resulting vibrational frequency and the resulting vibrational amplitude after a predetermined settling period from the offsetting.

12. The method of claim 10, with the vibratory meter comprising a vibrating densitometer, a vibrating gas densitometer, or a Coriolis mass flow meter.

13. The method of claim 10, with the method further comprising using the resonant frequency to generate one or more flow material quantifications.

14. The method of claim 10, wherein the predetermined vibration frequency range is selected to include a presumed resonant frequency.

15. The method of claim 10, wherein the predetermined vibration frequency range is narrowed to a predetermined narrowed frequency range after the resonant frequency is found, wherein the offsetting and determining is repeated in order to locate the resonant frequency within the predetermined narrowed frequency range.

16. The method of claim 10, wherein the predetermined vibration frequency range is narrowed to a predetermined narrowed frequency range after the resonant frequency is found, wherein the predetermined narrowed frequency range is substantially centered on the found resonant frequency and wherein the offsetting and determining is repeated in order to locate the resonant frequency within the predetermined narrowed frequency range.

17. The method of claim 10, wherein the predetermined vibration frequency range is widened to a predetermined widened frequency range if the resonant frequency is not found, wherein the offsetting and determining is repeated in order to locate the resonant frequency within the predetermined widened frequency range.

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18. The method of claim 10, wherein the resonant frequency can be determined for one or both of a particular vibratory meter or a particular flow material.