

What is claimed is:

1. A vibratory flow meter (5, 300), comprising:
a flow meter assembly (10, 310) including at least two vibration sensors (170L
and 170R, 303 and 305) that generate at least two vibrational signals; and
5 meter electronics (20, 320) that receives the at least two vibrational signals and
generate a new time difference (Δt) using multiple time difference
measurements obtained for a flow material and determine if the new time
difference (Δt) is within predetermined bounds of an old time difference
(Δt_0).
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2. The vibratory flow meter (5, 300) of claim 1, further comprising the meter
electronics (20, 320) being configured to prompt a user of the vibratory flow meter (5,
300) about replacing the old time difference (Δt_0) if the new time difference (Δt) is not
within predetermined bounds of the old time difference (Δt_0) and replace the old time
15 difference (Δt_0) with the new time difference (Δt) if the user selects replacement.
3. The vibratory flow meter (5, 300) of claim 1, further comprising the meter
electronics (20, 320) being configured to indicate one or both of the new time difference
(Δt) or the old time difference (Δt_0) to the user.
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4. The vibratory flow meter (5, 300) of claim 1, wherein the old time difference
(Δt_0) comprises a factory-derived zero-flow value.
5. The vibratory flow meter (5, 300) of claim 1, wherein the old time difference
25 (Δt_0) comprises an operationally-derived zero-flow value.
6. The vibratory flow meter (5, 300) of claim 1, further comprising the meter
electronics (20, 320) being configured to determine if the multiple time difference
measurements are substantially stable and prompting the user only if the new time
30 difference (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if
the multiple time difference measurements are substantially stable.

7. The vibratory flow meter (5, 300) of claim 1, further comprising the meter electronics (20, 320) being configured to determine if the flow material is substantially stable and prompt the user only if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if the flow material is substantially stable.
8. The vibratory flow meter (5, 300) of claim 1, further comprising the meter electronics (20, 320) being configured to:
- compare one or more selected drive power, drive gain, flow material pressure, flow material temperature, or flow material density values to corresponding reference values; and
 - determine that the flow material is substantially stable if the one or more selected drive power, drive gain, flow material pressure, flow material temperature, or flow material density values fall within predetermined tolerance ranges of the corresponding reference values;
- wherein the user is prompted only if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if the flow material is substantially stable.
9. A zero check method in a vibratory flow meter, the method comprising:
- generating a new time difference (Δt) using multiple time difference measurements obtained for a flow material; and
 - determining if the new time difference (Δt) is within predetermined bounds of an old time difference (Δt_0).
10. The zero check method of claim 9, further comprising:
- prompting a user of the vibratory flow meter about replacing the old time difference (Δt_0) if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0); and
 - replacing the old time difference (Δt_0) with the new time difference (Δt) if the user selects replacement.

11. The zero check method of claim 9, further comprising indicating one or both of the new time difference (Δt) or the old time difference (Δt_0) to the user.
12. The zero check method of claim 9, wherein the old time difference (Δt_0) comprises a factory-derived zero-flow value.
13. The zero check method of claim 9, wherein the old time difference (Δt_0) comprises an operationally-derived zero-flow value.
14. The zero check method of claim 9, further comprising determining if the multiple time difference measurements are substantially stable and prompting the user only if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if the multiple time difference measurements are substantially stable.
15. The zero check method of claim 9, further comprising determining if the flow material is substantially stable and prompting the user only if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if the flow material is substantially stable.
16. The zero check method of claim 9, with determining if the flow material is substantially stable further comprising:
- comparing one or more selected drive power, drive gain, flow material pressure, flow material temperature, or flow material density values to corresponding reference values; and
 - determining that the flow material is substantially stable if the one or more selected drive power, drive gain, flow material pressure, flow material temperature, or flow material density values fall within predetermined tolerance ranges of the corresponding reference values;
- wherein the user is prompted only if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if the flow material is substantially stable.

What is claimed is:

1. A vibratory flow meter (5, 300), comprising:
a flow meter assembly (10, 310) including at least two vibration sensors (170L
and 170R, 303 and 305) that generate at least two vibrational signals; and
5 meter electronics (20, 320) that receives the at least two vibrational signals and
generate a new time difference (Δt) using multiple time difference
measurements obtained for a flow material and determine if the new time
difference (Δt) is within predetermined bounds of an old time difference
(Δt_0), wherein the meter electronics (20, 320) are configured to determine
10 if the multiple time difference measurements are substantially stable.
2. The vibratory flow meter (5, 300) of claim 1, further comprising the meter
electronics (20, 320) being configured to prompt a user of the vibratory flow meter (5,
300) about replacing the old time difference (Δt_0) if the new time difference (Δt) is not
15 within predetermined bounds of the old time difference (Δt_0) and replace the old time
difference (Δt_0) with the new time difference (Δt) if the user selects replacement.
3. The vibratory flow meter (5, 300) of claim 1, further comprising the meter
electronics (20, 320) being configured to indicate one or both of the new time difference
20 (Δt) or the old time difference (Δt_0) to a user.
4. The vibratory flow meter (5, 300) of claim 1, wherein the old time difference
(Δt_0) comprises a factory-derived zero-flow value.
- 25 5. The vibratory flow meter (5, 300) of claim 1, wherein the old time difference
(Δt_0) comprises an operationally-derived zero-flow value.
6. The vibratory flow meter (5, 300) of claim 1, further comprising the meter
electronics (20, 320) being configured to prompt a user only if the new time difference
30 (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if the
multiple time difference measurements are substantially stable.

7. The vibratory flow meter (5, 300) of claim 1, further comprising the meter electronics (20, 320) being configured to determine if the flow material is substantially stable and prompt a user only if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if the flow material is substantially stable.

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8. The vibratory flow meter (5, 300) of claim 1, further comprising the meter electronics (20, 320) being configured to:

compare one or more selected drive power, drive gain, flow material pressure, flow material temperature, or flow material density values to corresponding reference values; and

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determine that the flow material is substantially stable if the one or more selected drive power, drive gain, flow material pressure, flow material temperature, or flow material density values fall within predetermined tolerance ranges of the corresponding reference values;

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wherein a user is prompted only if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if the flow material is substantially stable.

9. A zero check method in a vibratory flow meter, the method comprising:

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generating a new time difference (Δt) using multiple time difference measurements obtained for a flow material; and

determining if the new time difference (Δt) is within predetermined bounds of an old time difference (Δt_0).

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10. The zero check method of claim 9, further comprising:

prompting a user of the vibratory flow meter about replacing the old time difference (Δt_0) if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0); and

replacing the old time difference (Δt_0) with the new time difference (Δt) if the user selects replacement.

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11. The zero check method of claim 9, further comprising indicating one or both of the new time difference (Δt) or the old time difference (Δt_0) to a user.
12. The zero check method of claim 9, wherein the old time difference (Δt_0) comprises a factory-derived zero-flow value.
13. The zero check method of claim 9, wherein the old time difference (Δt_0) comprises an operationally-derived zero-flow value.
14. The zero check method of claim 9, further comprising prompting a user only if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if the multiple time difference measurements are substantially stable.
15. The zero check method of claim 9, further comprising determining if the flow material is substantially stable and prompting a user only if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if the flow material is substantially stable.
16. The zero check method of claim 9, with determining if the flow material is substantially stable further comprising:
- comparing one or more selected drive power, drive gain, flow material pressure, flow material temperature, or flow material density values to corresponding reference values; and
 - determining that the flow material is substantially stable if the one or more selected drive power, drive gain, flow material pressure, flow material temperature, or flow material density values fall within predetermined tolerance ranges of the corresponding reference values;
- wherein a user is prompted only if the new time difference (Δt) is not within predetermined bounds of the old time difference (Δt_0) and if the flow material is substantially stable.