CLAIMS

1. A method of determining inductances of a synchronous reluctance machine, **characterized** by

supplying a voltage pulse in the quadrature-axis or direct-axis direction of rotor,

sampling currents generated by the supplied voltage pulse,

calculating values of flux at the sampling instants from the value of the supplied voltage pulse, the sampled current values and the value of the stator resistance,

calculating synchronous inductance of the machine by dividing the calculated flux values by the corresponding sampled currents, and/or

calculating transient inductance of the machine as a derivative of the flux with respect to current, and

storing the calculated values as a function of current.

2. A method according to claim 1, **characterized** by the method comprising a step of magnetizing the rotor in a direction perpendicular to the direction of the voltage pulse before supplying the voltage pulse in the quadrature-axis or direct-axis direction of the rotor for obtaining inductance values with cross saturation.

3. A method according to claim 2, **characterized** in that the magnetization comprises the steps of

selecting a current reference for cross magnetization,

supplying voltage in a selected direction,

measuring current produced by the voltage, and

controlling the current to the current reference for the duration of the pulse test.

4. A method according to claim 2, **characterized** in that the magnetization comprises the steps of

selecting a flux reference for the cross magnetization,

supplying voltage in a selected direction,

measuring current produced by the voltage,

calculating the flux caused by the voltage from the value of the supplied voltage pulse, the sampled current values and the value of the stator resistance, and

controlling the flux to the flux reference for the duration of the pulse

test.

5. A method according to any one of the previous claims 1 to 4, **characterized** in that the calculated synchronous inductances are fitted to a function, which gives the values of the synchronous inductances as a function of current.

6. A method according to claim 5, **characterized** in that the transient inductance is calculated as a derivative of the function, which gives the values of the synchronous inductances as a function of current.

7. A method according to any one of the previous claims 1 to 6, **characterized** in that the method comprises a step of turning the rotor of the machine to a known position before the measurement sequence.

8. A method according to claim 7, **characterized** in that the known position is the direction of the x or y axis of the stator.

9. A method according to any one of the previous claims 1 to 6, **characterized** in that the method comprises the step of determining the rotor position before the measurement sequence.

10. An arrangement of determining inductances of a synchronous reluctance machine, **characterized** in that the arrangement comprises

means for supplying a voltage pulse in the quadrature-axis or direct-axis direction of a rotor,

means for sampling currents generated by the supplied voltage pulse,

means for calculating values of flux at the sampling instants from the value of the supplied voltage pulse, the sampled current values and the value of the stator resistance,

means for calculating synchronous inductance of the machine by dividing the calculated flux values by the corresponding sampled currents, and/or

means for calculating transient inductance of the machine as a derivative of the flux with respect to current, and

means for storing the calculated values as a function of current.

Claims

1. A method of determining inductances of a synchronous reluctance machine, the method comprising
supplying a voltage pulse in the quadrature-axis (q) or direct-axis (d) direction of rotor,
sampling currents (i_d, i_q) generated by the supplied voltage pulse,
calculating values of flux at the sampling instants from the value of the supplied voltage pulse, the sampled current values and the value of the stator resistance,
calculating synchronous inductance of the machine by dividing the calculated flux values by the corresponding sampled currents, and/or
calculating transient inductance of the machine as a derivative of the flux with respect to current, and
storing the calculated values as a function of current, **characterized in that** the method is carried out using a frequency converter connected to the synchronous reluctance machine and the method comprises a step of magnetizing the rotor in a direction perpendicular to the direction of the voltage pulse before supplying the voltage pulse in the quadrature-axis or direct-axis direction of the rotor for obtaining inductance values with cross saturation.

2. A method according to claim 1, **characterized in that** the magnetization comprises the steps of
selecting a current reference for cross magnetization,
supplying voltage in a selected direction,
measuring current produced by the voltage, and
controlling the current to the current reference for the duration of the pulse test.

3. A method according to claim 1, **characterized in that** the magnetization comprises the steps of
selecting a flux reference for the cross magnetization,
supplying voltage in a selected direction,
measuring current produced by the voltage,
calculating the flux caused by the voltage from the value of the supplied voltage pulse, the sampled current values and the value of the stator resistance, and
controlling the flux to the flux reference for the duration of the pulse test.

4. A method according to any one of the previous claims 1 to 3, **characterized in that** the calculated synchronous inductances are fitted to a function, which gives the values of the synchronous inductances as a function of current.

5. A method according to claim 4, **characterized in that** the transient inductance is calculated as a derivative of the function, which gives the values of the synchronous inductances as a function of current.

6. A method according to any one of the previous claims 1 to 5, **characterized in that** the method comprises a step of turning the rotor of the machine to a known position before the measurement sequence.

7. A method according to claim 6, **characterized in that** the known position is the direction of the x or y axis of the stator.

8. A method according to any one of the previous claims 1 to 5, **characterized in that** the method comprises the step of determining the rotor position before the measurement sequence.

9. An arrangement of determining inductances of a synchronous reluctance machine, the arrangement comprising
means for supplying a voltage pulse in the quadrature-axis (q) or direct-axis (d) direction of a rotor,
means for sampling currents (i_d, i_q) generated by the supplied voltage pulse,
means for calculating values of flux at the sampling instants from the value of the supplied voltage pulse, the sampled current values and the value of the stator resistance,
means for calculating synchronous inductance of the machine by dividing the calculated flux values by the corresponding sampled currents, and/or
means for calculating transient inductance of the machine as a derivative of the flux with respect to current, and
means for storing the calculated values as a function of current, **characterized in that** the arrangement is implemented in a frequency converter connected to the synchronous reluctance machine, and the arrangement comprises further
means for magnetizing the rotor in a direction perpendicular to the direction of the voltage pulse before supplying the voltage pulse in the quadrature-axis or direct-axis direction of the rotor for obtaining inductance values with cross saturation.