CLAIMS

What is claimed is:

1. A reducing system for chromium-based catalyst, comprising:

a catalyst feed system to provide a chromium-based catalyst to a mix vessel;

a reducing agent supply system to provide a reducing agent to the mix vessel; and

the mix vessel to hold a mixture comprising the chromium-based catalyst, the reducing agent, and a solvent to produce a reduced chromium-based catalyst for use in the polymerization of an olefin into a polyolefin, wherein the mix vessel comprises an agitator to agitate the mixture, and further comprises an entrance arrangement for the reducing agent, the entrance arrangement having a conduit extension to receive and direct the reducing agent into the mix vessel.

2. The system of claim 1, wherein the conduit extension extends into an interior of the mix vessel and directs the reducing agent to a vapor space of the mix vessel away from an inside surface of the mix vessel toward a top surface of the mixture level.

3. The system of claim 1, wherein the conduit extension directs the reducing agent toward a location of a surface of the mixture level that is 20% to 80% of a perpendicular distance from a vertical centerline of the mix vessel to an inside surface of a vertical wall of the mix vessel.

4. The system of claim 1, wherein a vertical centerline of the agitator is substantially the same as a vertical centerline of the mix vessel.

5. The system of claim 1, wherein the conduit extension comprises a nozzle insert through a nozzle of the mix vessel.

6. The system of claim 1, comprising:

a flow control valve to modulate the flow rate of the reducing agent to the entrance arrangement of the mix vessel;

a variable drive to modulate an agitation rate of the mixture by the agitator, wherein the agitation rate comprises revolutions per unit of time of a shaft of the agitator; and

a heat transfer system to provide a heat transfer medium to a jacket of the mix vessel.

7. The system of claim 1, comprising a control system to facilitate adjusting agitation rate in revolutions per time of the agitator to give a desired flow index response of the reduced chromium-based catalyst.

8. The system of claim 1, comprising a control system to facilitate adjusting flow rate of the reducing agent to the entrance arrangement to give a desired flow index response of the reduced chromium-based catalyst, and wherein the control system facilitates adjusting a drying line-out temperature of the reduced chromium based catalyst in the mix vessel to give a desired flow index response of the reduced chromium-based catalyst.

9. The system of claim 1, wherein the chromium-based catalyst comprises an inorganic support comprising a surface area of 50 to 1000 square meters per gram and an average particle size of 20 to 300 micrometers.