The dropout filter option addresses the problem of unhygienic drain filter cleaning by replacing the conventional P-Trap found at the bottom all household sinks with a modified component that allows for more frequent and less time-consuming cleaning. The primary feature of the dropout filter is a detachable filter branch that follows the axis of the sink drain beyond the bottom of the P-Trap, which serves to catch any non-liquid debris that falls into the sink. This branch of the dropout filter is attached to the rest of the plumbing by threads on the structure – “Mating Threads” in the diagram – and can therefore be detached from the plumbing. To prevent standing water from leaking out of the P-Trap, a ball valve is installed on filter branch of the P-Trap, which should be open during regular operation, but must be closed during cleaning. Once the filter branch is removed, it will contain a mixture of excess water and debris that was collected. The water can be decanted back into the sink and the debris dumped into the garbage or compost (depending on the contents). To reset the system, the filter module can be threaded back into place and the ball valve opened.

Most household pipes in use today are made of PVC or a similar polymer which is melted and injected into a mold for production. Manufacturing this design would likely have to be done with this process as there are few other cost-effective ways of producing intricate shapes in plastics on a large scale. The ball valve in particular was chosen because it can be injection molded for a very low cost with a handful of parts and without compromising reliability or function.

With old food and drinks passing through and sitting in it regularly, the drain filter in a sink can be one of the least hygienic parts of a kitchen. Despite this, most household drain filters require that they be cleaned by hand, resulting in an unpleasant and potentially unhygienic user experience. To address this issue, this report presents a variety of candidates that could replace the conventional kitchen sink drain filter with something that addresses the problems associated with a conventional sink filter, followed by a critique of the divergence tools that were used to generate the candidates. The first section of this report, Part 1: Candidate Designs, can be used by a group to first refine the objectives, metrics, criteria and constraints presented in the **design brief provided**, and eventually converge upon and develop one of the candidates into a recommended design. The second part of this report, Part 2: Divergence Tools Critique, takes a retrospective look at the process that produced the candidates in Part 1, commenting specifically on the purpose and efficacy of a particular tool.

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One of the first tools we used was the Challenging Assumptions technique, described at the top of the figure above. We found that combining steps 1 and 2 into a single clear ‘Assumptions’ category worked better for us because it allowed us to append our idea onto the critical word(s) we decided upon. We then organized our ideas by filtering then combining some of the assumptions that were either too similar or too unrelated (e.g., ‘The sink is on Earth’ didn’t seem within the scope of the design brief). With these assumptions developed, we began to prod at the ones we thought weren’t well justified, creating the list of challenges at the bottom of the figure. From this, we were able to come up with our first ideas. The idea that the filter doesn’t have to be removed through the top of the sink and that it could store waste out of the path of the flow of water led us to our design candidate 1, the dropout filter, while the idea that the filter doesn’t have to be removeable put us on the path to developing our candidate design 3, the vacuum drain, which was developed in parallel with design tool 4.

While this tool led us to some of our candidates, it’s greater value to us was in that it made us aware of the limitations we were putting on our designs subconsciously early in our design process. This insight proved valuable in subsequent diverging activities when we were able to look back upon and refine our ideas by asking if the assumptions were justified. In the future, I plan on using this tool early in the diverging process as it has shown to be effective at helping me understand the biases I have going into a design.